



VOL.V.


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ANNUAL
AND
ANALYTICAL CYCLOPÆDIA
OF
PRACTICAL MEDICINE

BY
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AND
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VOLUME V



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PREFACE TO THE FIFTH VOLUME.

IN presenting the fifth volume to the profession the editor cannot but express the hope that it will merit the kind appreciation bestowed upon its predecessors, not only by the patrons of the work, but also by the medical press. It has proved to be the most arduous one to prepare of the entire series, involving, as it does, almost every specialty—otology, laryngology, ophthalmology, neurology, pædiatrics, obstetrics, therapeutics, etc.—besides the sections usually classed under general medicine and surgery. The continued assistance of the members of the associate staff has greatly facilitated the labors of the central department; the indebtedness involved is gratefully acknowledged.

Death has claimed, since the publication of the fourth volume, two members of the associate staff: Dr. Norman Kerr, of London, and Dr. J. E. Graham, of Toronto. Dr. Kerr has been an associate editor since 1893, and his able articles upon inebriety, morphinism, and kindred disorders will doubtless be remembered by many of our readers, owing to the erudition displayed in them, the refined language used, and the elevated motives discernible in every line. The paper on “Morphinism” published in this volume is his last contribution to medical literature. Though written by the editor, it is elaborated in Dr. Kerr’s own words, and portrays his thoughts; while his signature bears witness to a careful revision—accomplished not long before he departed this life. The special field to which Dr. Kerr devoted his labors has lost its most brilliant exponent; the profession at large one of its most faithful and honest workers.

Dr. Graham had been a member of the staff about two years. His article upon “Cholelithiasis”—probably the finest encyclopædic review of the subject extant—typifies all his labors, and, in particular, two traits which dominated his entire career: *i.e.*, thoroughness and sincerity of purpose. His last contribution to medical literature will appear in the sixth volume of this work: the article on “Typhoid Fever.” It fully sustains his reputation as one of Canada’s most distinguished clinicians, and but accentuates the great loss which his untimely death has imposed upon the entire profession.

In the preface of the fourth volume special attention was drawn to an article by Dr. Blackader, of Montreal, on the “Diarrhœal Diseases of Infants.” In this volume will be found a complementary paper of very great value by Drs. L. Emmett Holt and L. E. La F  tra, of New York, entitled “Nursing and Artificial Feeding.” The mortality among infants during the summer months would be greatly reduced if the teachings of these papers were carefully studied and carried out. Two kindred subjects have been treated in a manner differing somewhat from the usual, namely: the “Disorders of Pregnancy,” by Dr. Currier, of New York, and “Abnormal Parturition,” by Drs. Grandin and Marx, of the same city. Instead of repeating text with which a physician’s shelves are usually fully

supplied,—text-book matter,—these articles aim to give the newer aspects of these questions and the tendency of progressive thought.

Among the other articles presented which call for especial notice are “Pleurisy,” by Dr. Alexander McPhedran, of Toronto; “Catarrhal Pneumonia,” by Dr. Solomon Solis-Cohen, of Philadelphia; and “Lobar Pneumonia,” by Dr. Thomas G. Ashton, of the same city.

Through an unaccountable error, an excellent article on the “Diseases of the Lens” (page 337, fourth volume), written by Dr. F. W. Marlow, of Syracuse, was credited to his colleague on the staff, Dr. Edward Jackson, of Denver. The editor greatly regrets this mistake, which deprives Dr. Marlow of the credit to which he is so thoroughly entitled.

THE EDITOR.

2043 WALNUT STREET,
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SAJOURS'S ANNUAL

AND

ANALYTICAL CYCLOPÆDIA OF PRACTICAL MEDICINE.

M

METHYL-BLUE.—Methyl-violet or methyl-blue, an aniline dye introduced as an antiseptic by Stilling under the name of *pyoktanin*, is thought to be a mixture of methyl-parasanilins in various proportions. It occurs in the form of pasty, bluish-violet, odorless crystals.

Preparations and Doses.—It may be used powdered, but greatly diluted with talc or some other inert substance (0.1 to 2 per cent.), and may be molded into pencils. It is most usually employed in solution from 1-100 to 1-2000.

Physiological Action.—The germicidal properties of methyl-blue have been defended by Fessler and Trojé, but the conflicting views of these authors have tended to impair the value of their experiments. According to Fessler, pyogenic organisms were killed by exposure to a 1 to 1000 solution during 15 minutes; Trojé found that at least 12 hours were required. These discrepancies were sustained by clinical experience, various observers obtaining conflicting results in surgical and especially ophthalmic work. The cause of this was explained by Liebreich, when he showed that the composition of methyl-blue was uncertain. Indeed it may either be a tetra-, a penta-,

or a hexa- methyl-parasanilin, or a mixture varying in proportions.

Therapeutics.—Though the results have been contradictory, there is much evidence in favor of the value of methyl-blue as an antiseptic in the treatment of suppurating wounds, and chronic disorders of the mucous surfaces. In conjunctivitis, ulcers of the cornea, trachoma, and corneal opacities it has been found of marked benefit by some observers and valueless by others. The cause of this, perhaps, lies in the fact that a solution of methyl-blue is unstable. Stilling especially recommends that a solution should be filtered, kept in dark bottles, and renewed every eight days.

MALIGNANT TUMORS.—Good results have been obtained with methyl-blue in the treatment of epithelioma. It may either be injected, as in the case of superficial neoplasms, when a 10-per-cent. solution is to be used, or given internally in doses varying with the strength of the patient. It must be borne in mind, however, that under all circumstances removal with the knife is preferable, and that methyl-blue should only be employed in inoperable cases.

Methyl-blue tried in the treatment of internal neoplasms of a malignant

nature. It was given three times a day in doses of 1 grain, in pill form, or associated with belladonna as a suppository: Pyoktanin, 1 grain; extract of belladonna, $\frac{1}{8}$ grain; cocoa-butter, 31 grains. In a case of pronounced cancer of the stomach an astonishing result was obtained: the patient increased in weight, the vomiting and eructations ceased, and his appetite reappeared. O. Maibaum (Medycyna, No. 43, '95).

In a patient suffering from villous cancer of the gall-bladder a pencil was introduced into the examination-wound every two days, and $9\frac{1}{4}$ grains in pills given. This treatment, begun March 6th, was followed by complete cure, at the time of report, May 6th. Mosetig-Moorhof (Univ. Med. Jour., July, '94).

Literature of '96-'97-'98.

Case of epithelioma of the chin cured by interstitial injections of a 10-per-cent. aqueous solution of methyl-blue. At first an injection of 25 minims was made every two days. Later the amount was decreased, and only one or two injections were made during a week. The entire period of treatment was six months. The tumor atrophied, and at the end of the period of treatment only a fibrous cicatrix remained. Eight months later there had been no recurrence. Dubarry (Rev. de Thér., Apr. 15, '97).

In some cases it is necessary to combine the effects of methyl-blue with those of other agents—especially chromic acid and the galvanocautery, these being utilized mainly to destroy the superficial *detritus*.

Series of cases of cancerous tumors of the face rapidly cured by daily applications of 1 to 20 methyl-blue. It is, however, much more efficacious and rapid in action if the affected area be first cauterized, either with chromic acid or with galvanocautery. In deep tumors it should be injected hypodermically; and, where a large surface has been destroyed by the growth, skin-grafts should be used between the fifteenth and twenty-first days. Darier (La Sem. Méd., May 23, '94).

Literature of '96-'97-'98.

Case of a woman, 57 years old, suffering with epithelioma of the face. The scabby surface of the epithelioma occupied the entire right side of the chin from the hollow as far as the middle of the horizontal ramus of the maxilla; vertically, it extended beyond the fold of the lower lip, and beyond the body of the maxilla. The surrounding tissue was red, hard, and œdematous; and the lip was much thicker on the diseased side. The tumor was divided into four lobes, each one of which was covered with bloody scabs. When they were separated, a large quantity of bloody pus was discharged. The tumor was adherent to the periosteum of the maxilla. Operation was refused and interstitial injections of methyl-blue were tried, although without any hope of success. During the first applications, 30 grains of a 10-per-cent solution in distilled water were injected. Each time the entire diseased surface was saturated, the needle being pushed as deep as possible, until it touched the periosteum, the liquid being thrown in all directions. This was repeated as often as it was necessary. The tumor and all the red tissue surrounding it became of a bluish color. Several times hæmorrhages were provoked, but they were not alarming or of long duration, and a slight compression rapidly arrested them.

After the first application the intense itching complained of disappeared. During the first three months an injection was given regularly every two days, the average quantity of liquid injected being 15 grains. After a month of this treatment the tumor noticeably diminished in size. After the third month it had diminished one-half; cicatrization occurred from the periphery toward the centre. As recovery approached, a more considerable resistance was felt; the tissues became more compact and denser. During the fourth and fifth months of the treatment only one or two injections a week were practiced; the quantity of liquid used was also diminished in proportion as recovery advanced, and during this stage not more than two or three divisions of a Pravaz syringe were filled for the injection. At no time did the patient

feel pain in the kidneys or experience trouble on micturition. Five months after the first injections treatment was stopped; eight months later there was a firm cicatrix on the spot where the epithelioma had been, which was crossed in all directions by fibrous bands, which were very resistant to the finger and adhered to the maxilla. Dubarry (Normandie Méd., Apr. 1, '97).

METHYLENE-BLUE.—Methylene-blue is one of the aniline dyes, a diphenylamin compound resulting from the action of sulphide of hydrogen and chloride of iron upon a solution of dimethylparaphenylenediamin. It occurs as a fine powder resembling iron filings. A solution of methylene-blue cannot be distinguished from a solution of methyl-blue, or methyl-violet (*pyoktanin*), without great care, and toxic effects have been observed as a result of errors in prescribing the one drug for the other, the dose of pyoktanin being smaller.

Administration and Dose.—The dose of methylene-blue is 1 to 3 grains.

Literature of '96-'97-'98.

Three cases of poisoning by what was supposed to be methylene-blue. In one of these the patient took the first dose at 2 P.M., and at 5.30 P.M. he had a distressing attack of vomiting. Patient was advised to continue his medicine. Five days later the patient reported that he could not retain it, and that it caused much purging. An investigation was made and it was found that the chemist had gotten a fresh supply of aniline, and that the new stock he had purchased was Merck's methyl-blue (pyoktanin), and not methylene-blue. Methylene-blue is an entirely different preparation from methyl-blue, or pyoktanin. Harrington (Canadian Pract., July, '97).

Test to distinguish methylene-blue from methyl-blue (pyoktanin). The meniscus on the surface of a solution of methylene-blue in a test-tube, or a thin film of such a solution, has a greenish instead of blue color, while that of

methyl-blue is blue under all circumstances. Another test may be made by adding sodium hydroxide to the blue solution, when methyl-blue becomes of a purplish-red, resembling port-wine dregs, while methylene-blue turns a deep-violet color. A. C. Smith, U. S. M.-H. S., quoted by S. T. Armstrong (Foster's "Pract. Thera.").

Physiological Action.—In guinea-pigs a toxic dose of methylene-blue is followed, according to Combemale, by marked increase of the reflexes and of respiratory movements, ending in muscular paralysis and death. At the necropsy there is found a chocolate discoloration of the blood, caused by a destructive action upon the red blood-corpuscles, flaccidity of the heart, pulmonary atelectasis, engorgement of the liver with blue discoloration of the biliary ducts, and of the gastric and intestinal mucous membrane. T. Lauder Brunton and S. Delépine subsequently observed that the drug sometimes caused a great accumulation of iron in the liver.

Ehrlich and Leppmann having expressed the view that the analgesic properties of methylene-blue depended upon an elective affinity for the cylinder-axis of the nerve-endings, Combemale argued that the freedom of pain was mainly due to the altered condition of the blood noted. Still, all that can be affirmed is that the drug shows two main active properties: it is capable of acting as an irritant and it can produce sedation of the motor and sensory nerves.

Recent experiments on frogs and rabbits by Mikhaïloff have shown that the leucocytes did not fix the methylene-blue until within a short time before death, and then very rarely. Healthy protoplasm was not colored by methylene-blue. At the autopsy of the animals experimented upon for a period of three weeks there had been found in all the visceral

cavities a liquid colored blue; all the organs were also colored; the blood was methæmoglobinized, and the result had been a loss of oxygen, which had caused degeneration of the parenchyma and had favored thrombosis.

Methylene-blue can be detected in the saliva forty minutes after its introduction by the mouth, and in one hour and fifteen minutes after its administration by the rectum. Lemanski and Main (*Le Bull. Méd.*, Jan. 29, '93).

Therapeutics. — **RENAL DISORDERS.** — Methylene-blue being eliminated by the urine, Achard and Castaigne recently conceived the idea of using this property to determine renal permeability when disease of the kidney is suspected. When the kidneys were normal methylene-blue proved to be eliminated rapidly, communicating to the urine a distinctive color; in diseased conditions, however, elimination was retarded. Considerable œdema did not hinder the absorption of the methylene-blue, and its consequent appearance in the urine. The authors were able to trace, by defective elimination, the progress of lesions, which were at the same time indicated by the increase in clinical symptoms.

A dose of $1\frac{1}{2}$ grains of methylene-blue colored the urine until the third day. After a dose of $\frac{3}{4}$ grain the urine was still colored on the following day, and even to a slight degree on the day after. The dose being gradually lessened, it was found that after $\frac{1}{3}$ grain the urine was distinctly colored, and had not entirely regained its normal appearance the next day. Constantin Paul (*La Sem. Méd.* Dec. 30, '91).

Literature of '96-'97-'98.

Fifty observations in which use of methylene-blue in the diagnosis of renal permeability was used.

In 22 the blue was eliminated in a normal fashion, and autopsies in 5 of these showed that the kidneys were sound

notably in one case of phthisis, and an other of pneumonia in which albuminuria was present during life. On 23 occasions the permeability of the blue was faulty, and in 13 of these alterations in the kidneys were discovered after death. The lesions found were suppurative pyelonephritis in 3, considerable renal atrophy in 1, infarcts in a solitary kidney in 1, and cystic kidneys in another, in whom albuminuria was absent during life.

In limited lesions of the kidney—tubercular, for instance—in which the rest of the organs was healthy, the permeability was normal.

In several permeability varied. Thus a phthisical patient in whom it had been normal, suddenly showed delay of elimination, while œdema, albuminuria, and hæmaturia made their appearance.

On the contrary, in acute affections permeability was defective only throughout the illness, and became normal on recovery.

Some cases seemed to show that excess of permeability was as much a sign of disease as insufficiency.

The methylene-blue is given by intramuscular injections of 1 cubic centimetre of a 1 to 20 solution.

In some cases the blue is slowly eliminated, but the urine from the first gives a green coloration when warmed with acetic acid.

This is due to a colorless chromogen insoluble in chloroform, which latter precipitates it from methylene-blue.

In nine patients there was no delay in elimination of either chromogen or blue.

In eight others elimination of both was delayed; these had symptoms of renal disease, and the diagnosis of renal disease was verified often on post-mortem examination.

Often in similar cases the chromogen was eliminated before the blue, thus showing that the former is more diffusible and passes more easily through diseased kidneys than the latter.

In 11 there was only delayed elimination of blue, while the chromogen passed within the first hour after administration.

There were many clinical symptoms of

renal disease in these, and on two occasions post-mortem examinations revealed advanced degenerative changes in the renal epithelium.

Delayed elimination of the blue alone occurs in some cases of renal disease, but it is not yet possible to state that renal changes are the sole cause of this. It is important, however, to test for chromogen by heat and acetic acid in patients who eliminate blue slowly, as by comparing the rate at which both chromogen and blue are eliminated one may be able to arrive at useful aids to diagnosis. Achard and Castaigne (*La Sem. Méd.*, June 23, '97).

The usefulness of methylene-blue will be greatest as a means of testing the permeability of the kidney and in the treatment of the early stages of chronic Bright's disease, while it ought to be invaluable in those cases of renal inadequacy occurring as concomitants of acute infectious and contagious disease, where the probable selective effect of the drug upon the functional epithelium of the tubules and glomeruli, stimulating the excretory function, will prevent the accumulation of toxic material in the blood. H. A. Tomlinson (*Northwestern Lancet*, xviii, p. 61, '98).

Methylene has been used with success in renal disorders of various types, including cases of interstitial nephritis.

Methylene-blue used in twelve cases of acute nephritis, $4\frac{1}{2}$ grains being given three times daily, every other day. The results were good. G. Leventhal (*Wratsch*, No. 22, '94).

Methylene-blue administered in a case of chyluria due to the *Filaria sanguinis hominis*. The effects of the drugs were decided and prompt. Austin Flint (*N. Y. Med. Jour.*, June 15, '95).

Literature of '96-'97-'98.

Methylene-blue is an excellent microbicide, it coagulates pus, it prevents fermentation, and it is an excellent analgesic when given internally. These properties determine its indications in various affections of the urinary system. G.

Richard d'Aulnay (*Bull. Gén. de Thér.*, Se liv., p. 352, '97).

Methylene-blue employed in 8 cases of albuminuria. In 5 of these there was rapid diminution; in 3 complete disappearance of the albumin. The diseases represented were subacute and interstitial nephritis, sometimes complicated with renal congestion. The doses employed varied from $\frac{1}{3}$ to $\frac{3}{4}$ grain per day. Lemoine (*Compt. Rend. de la Soc. de Biol.*, May 7, '97).

Methylene-blue is an analgesic, as is well known. Its property of staining axis-cylinders of nerves has suggested to Ehrlich that it might prove as analgesic in painful neuroses of which neuralgia is the main type. It was also found effective in reducing the pain of rheumatism and sciatica.

On account of the property of methylene-blue's staining nerve-tissues, especially the axis-cylinder, this drug has been tried as an analgesic in the treatment of 25 cases of painful affections. It was used both hypodermically (15 grains to 1 drachm of a 2-per-cent. solution) and internally by capsules (dose, $\frac{1}{6}$ to 15 grains per day). In 15 minutes the urine was noticed to be light green, in 2 hours a bluish green, and in 4 hours a dark blue. The saliva and feces were also colored, but the conjunctiva, skin, and mucous membrane remained free from color. In 2 hours from the time of administration the pain usually began to be relieved. Ehrlich and Leppmann (*Wiener med. Presse*, June 22, '90).

Complete relief obtained in neuralgias of unknown cause, of neuritis of alcoholism, of ataxia in the second period, and of bone-pains of tubercular, syphilitic, and traumatic origin. Methylene-blue relieved, without destroying entirely, certain neuralgias, and the pains of sclerosis of the spinal cord and those of subacute articular rheumatism. Finally, the drug failed to act in the neuralgias of hysteria, in the lancinating pains of the cachectic period of tabes, and in those of acute articular rheumatism. The drug was usually given in doses of 3 grains a day. The untoward effects most

commonly, although not frequently, observed were cephalalgia, nausea, and diarrhœa. Combemale (Bull. Gén. de Thé., Apr. 30, '91).

Methylene-blue used as an analgesic with great success in neuralgia, sciatica, and locomotor ataxia, $4\frac{1}{2}$ grains a day to be given. Lemoine (Le Bull. Méd., Apr. 21, '95).

Literature of '96-'97-'98.

Methylene-blue recommended in acute articular rheumatism. It has a favorable effect upon the local inflammatory process in the joints and upon the general condition of the patients. J. R. Philpots (Brit. Med. Jour., Mar. 27, '97).

Methylene-blue is particularly valuable in those forms of rheumatoid arthritis due to autointoxication from the intestinal tract. W. Armstrong (Brit. Med. Jour., Apr. 24, '97).

Methylene-blue is valuable in habitual headache and hemierania. It may be given in $1\frac{1}{2}$ -grain doses along with equal parts of powdered nutmeg, the object of the latter being to prevent irritation of the bladder. E. Thomson (St. Petersburger med. Woch., May 30, '98).

MALARIAL FEVERS.—Guttman and Ehrlich, basing their opinion upon the fact that methylene also stains the hæmatozoön, were also led to consider this agent as of value in diseases in which the parasite was found. The remedy was also tried with apparent success by Thayer, of Baltimore, in doses averaging $1\frac{1}{2}$ grains five times a day. The only untoward effect produced, when given by itself, was that of strangury, but this was relieved by the ingestion of nutmeg. This unpleasant symptom did not appear if the nutmeg were given from the beginning.

Though effective, methylene-blue is very inferior to quinine or arsenic. In fact, Pilliet questions whether the good effects obtained from the use of the drug in malaria are not due to the arsenic contained in the arsenous methylene-blue,

the most common form used; also whether the unpleasant effects sometimes observed may not have the same origin.

Methylene-blue used in thirty cases of intermittent fever uncontrolled by quinine, powdered nutmeg being employed to prevent unpleasant secondary effects. Attacks were not only arrested, but even prevented. Kasem-Beck (Wratsch, Nos. 23, 27, '93).

Methylene-blue is of use in quotidian intermittent fever. The dose used is 8 grains daily, in four portions. Its favorable action is due not to the fact that it exercises any direct influence upon the plasmodia, but that it modifies the constitution of the blood, thus making it unfavorable for the growth of micro-organisms. Dabrowski (Wratsch, No. 11, '93).

Methylene-blue tried in four cases of intermittent fever in children. The patients soon showed a dislike for the remedy, which was vomited. It can in no way replace quinine in malaria, though it may be tried where children absolutely refuse to take quinine. Baginsky (Archiv f. Kinderh., B. 17, H. 3, '94).

Literature of '96-'97-'98.

Methylene-blue used in malaria, 10 or 12 grains being given to adults about ten hours before the rise of temperature is expected. A combination of it with quinine was often found to act especially well, and it is useful in cases where quinine alone has proved of no avail. It is apt to cause cystitis. Immunity to the malarial poison seems to follow on its continued use. Cardamates (Ther. Gaz., July, '98).

GONORRHOEA.—In this disease it seems to have proved of value when used internally and locally.

Methylene-blue used in the treatment of blennorrhagia apparently with good results. The drug acts on the micro-organisms, diminishing their vitality and virulence. A similar action may be said to occur in the case of gonococci. E. Boinet and P. Trintignan (Marseille-méd., Sept. 1, '92).

Gonorrhœal vaginitis may be treated with the following solution:—

R Methylene-blue, $2\frac{1}{2}$ drachms.
 Alcohol, $3\frac{3}{4}$ drachms.
 Potassium, 3 grains.
 Water, $6\frac{1}{4}$ ounces.

Two or three tampons of cotton wet with this solution are introduced into the posterior vaginal fornix and retained for two days. The pus-secretion stops by the fourth day, and congestion disappears in about twenty days. D'Aulnay (La Sem. Méd., No. 53, '93).

Literature of '96-'97-'98.

Methylene-blue is given in gonorrhœa in doses of 3 grains three times a day, also 15 grains of potassium citrate three times a day. James Moore (Brit. Med. Jour., Jan. 16, '97).

Methylene-blue has been tried in a large number of disorders, but in none except those mentioned has it shown itself of special value.

METRITIS (SUBINVOLUTION OF THE UTERUS).—Since metritis and endometritis in the septic sense nearly always co-exist in the same case the reader is referred to the article on ENDO-METRITIS. Inflammation of the uterus or appendages occurring after labor interferes with normal involution, and gives rise to a series of changes called *puerperal subinvolution*. Irritation or inflammation existing at the time of menstruation interferes with the subsidence of the menstrual development, and causes a persistent enlargement, which has been called *menstrual subinvolution*.

Puerperal Subinvolution.

Symptoms and Diagnosis.—In cases observed within the first week or two after labor or abortion there may be the symptoms of acute endometritis, and infection of the pelvic viscera may appear. These have been reviewed under ECLAMPSIA.

In others there may be no symptoms that attract attention until the patient

leaves the bed, or begins to use the vessel for a passage of urine or fæces, when she may be taken with uterine hæmorrhage and perhaps with uterine cramps and faintness. There is usually a slight elevation of temperature and some suprapubic tenderness. An examination reveals an enlarged, tender uterus with a patulous os. In cases occurring after labor, or after abortion during the latter half of pregnancy, the finger easily passes the internal os and discovers masses or shreds of adherent placenta. That portion of the uterine wall to which these are attached is usually relaxed, and may bulge into a generally relaxed uterine cavity, or may be surrounded by an irregularly-contracted uterus.

If the placental site is at or near the fundus, a contracted ring may have formed just below it.

In other cases the patient will get up with more or less backache and feelings of weight and pressure in the pelvis, and with some leucorrhœa. The menses will usually become established early, and will be abundant or even profuse.

Literature of '96-'97-'98.

In acute metritis the pain is deep-seated and diffuse, and radiates toward the loins, hips, and hypogastrium. It is principally intrapelvic, and is accompanied by vesical and rectal tenesmus. Doléris and Pichevin (La Gynéc., No. 6, '96).

An examination reveals a large, soft uterus lying low in the pelvis. The cervix is soft and purplish, and the vagina and perineum relaxed and somewhat deeper in color than natural. In occasional cases a piece of placenta is passed several weeks after labor or abortion.

As the condition becomes more chronic, the uterus remains enlarged, but grows hard, while the cervix assumes a pale, anæmic appearance. Or the cer-

vix may show the signs of laceration, erosion, and ectropion. The later symptoms are those of chronic endometritis. The menorrhagia may persist, or it may finally grow less and be followed by normal or even by scanty menstruation.

Etiology.—Any inflammation or traumatic injury within the pelvis may act as a cause. Retained particles of placenta, laceration of the cervix, and infection are the most common ones.

Retroversion of the uterus, pelvic tumors, getting up too soon, and frequent coitus may also delay or prevent complete involution.

Pathology.—In puerperal subinvolution the uterine muscular fibres and blood-vessels take on atrophic changes much slower than normal. The muscular fibres are longer than natural and relaxed; the blood-vessels are enlarged and surrounded by a serous infiltrate. The walls are purplish in color and soft, are easily injured, and, if injured, bleed freely. This condition may continue for many months.

As a rule, there is a focus of inflammation at the placental site or about a cervical laceration, which causes the ordinary changes of inflammation to extend to a greater or less distance into the parenchyma.

After a time embryonic cells appear between the muscular fibres and about the blood-vessels, and, as they mature, diminish the caliber of the blood-vessels and displace and cause atrophy of the uterine muscular fibres. Thus in time the walls become pale and anæmic, and the connective tissue predominates over the muscular, giving the structure a hard, fibrous character.

Prognosis.—Many cases get well when the endometritis or periuterine inflammation subsides. In those in which large pieces of placenta remain in the uterus

the subinvolution rapidly disappears if these are expelled early and before the uterine walls have become deeply infected. Long retention and infection of retained particles may result in a chronic subinvolution that will persist until long after the menopause. In long-standing cases in which the uterine walls have become hard and anæmic, treatment has but little effect upon the enlargement of the organ.

Parenchymatous metritis is not so important a factor in the etiology of abortion as is endometritis. That form, however, arising from puerperal infection is very prone to induce an abortion should the woman conceive. Syphilitic metritis, also, is a common cause of abortion. Infectious metritis is a most virulent form of the disease, almost invariably resulting in the death of the ovum and its ultimate discharge, and not infrequently in maternal death also. Cumston (Boston Med. and Surg. Jour., Aug. 29, '95).

Treatment.—The prophylactic treatment consists in a complete evacuation of the uterus after labor, the avoidance of laceration of the cervix and of infection, and in rest in bed until the uterus and cervix are firmly contracted and greatly reduced in size.

If after a week or ten days the internal os will admit one or two fingers, the vulva and vagina should be thoroughly disinfected, and the uterine cavity completely emptied by the finger. In many cases the tenderness makes it necessary to administer an anæsthetic to accomplish this. Firm pressure can then be made over the pubes, and the uterus be retroverted or depressed until the fundus can be reached. In recent cases with irregular contraction of the uterus the particles should be sought for until the whole organ contracts and expels the finger. The uterine cavity is then douched out with a 1 to 2000 solution of corrosive mercuric chloride, and the pa-

tient kept in bed for ten days or two weeks.

If the uterine walls are flabby and infiltrated, they will not contract firmly, and more or less hæmorrhage takes place. In such a case the uterine cavity, after being douched with the 1 to 2000 solution of corrosive mercuric chloride, is packed with sterile nosophen or iodoform gauze. This is removed in twelve or eighteen hours and the vagina douched with the same solution, and twice daily thereafter until after the temperature becomes normal.

Cases of several weeks' duration should be treated by curettage and the repair of the cervix.

Ichthyol recommended in metritis. After vaginal irrigation, a 5- to 10-per-cent. solution in glycerin is applied to the neck of the uterus as a tampon; this is followed with inunction of the abdomen several times a day with ichthyol in vaselin, 20 to 25 parts in 100. Rapid diminution of pain and abundant vaginal secretion soon take place, with cicatrization of the ulceration. Calderini (*Revue Gén. de Clin. et de Thér. Jour. des Prat.*, Dec., '93).

While the chief action of ichthyol is to relieve pain, it also possesses certain resorbent qualities, in some cases relatively powerful. Its use is not attended with danger or discomfort, the powdered drug being generally more satisfactory and reliable than solutions. Storer (*Boston Med. and Surg. Jour.*, Aug. 2, '94).

Literature of '96-'97-'98.

Recovery from septic metritis and general peritonitis after treatment with antistreptococcic serum. Law (*Brit. Med. Jour.*, Jan. 2, '97).

Continued irrigations of the uterus successfully used for acute puerperal septic metritis. Under the influence of continuous irrigation the uterus contracts well and fast. The fissure heals rapidly. Irrigation must be kept up until such time as it is certain that there is no more internal suppuration; otherwise the os,

now firmly closed, will retain the discharge, and the temperature will rise again one or two degrees. Horace Mansau (*N. Y. Med. Jour.*, July 23, '98).

In chronic cases these operations must sometimes be followed by local treatment, such as the application of a 33-per-cent. solution of chloride of zinc every two weeks or by mild galvanocautery.

Menstrual Subinvolution.

Symptoms and Diagnosis.—Menorrhagia exists in many cases. Dysmenorrhœa is common and, although it may be connected with uterine cramps in case there be stenosis, usually persists during and after the period as an aching pain or soreness in the pelvis or sacrum, increased by being on the feet. Headache and hysteria are, if present, worse at such times.

In chronic cases the menses may become scanty, and the patient often claims that she feels badly in proportion to the scantiness, and is apt to demand emmenagogues.

The symptoms between the menstrual periods are similar to those of endometritis.

Examination usually reveals a symmetrically enlarged uterus. The cervix is large and dark red or purple in color, and in the advanced stages is hard. The uterine cavity is from three to three and one-half inches long. The ovaries are usually enlarged and more or less tender.

The uterus may hang low in the pelvis, or it may be held high up by rigid sacro-uterine ligaments or by adhesions.

Etiology.—The causes include those of endometritis.

Causes which act either in conjunction with endometritis or distinct from it, interfering with the normal post-menstrual involution or retrogression, are as follow:—

1. Mechanical, — such as displace-

ments, tumors, stenosis of the cervix, pelvic exudates, etc.

2. Active inflammation in the pelvis,—such as endometritis, oöphoritis, salpingitis, etc.

3. Traumatism and disturbances of the circulation acting during the menstrual congestion,—such as blows and strains, catching cold, excessive coitus, onanism, and fatiguing or long-continued labor.

Pathology.—In many cases the uterine walls become progressively thicker and the uterus larger, while those in the endometrium do not keep pace with them, or become less and less pronounced. The blood-vessels are enlarged and the tissues infiltrated with serum and migratory cells. The muscular fibres may at first be enlarged, but soon become separated from one another by embryonic cells, which also surround the blood-vessels in large quantities. In time, adult connective tissue forms, which compresses and causes atrophy of the muscular fibres, and diminishes the caliber of the blood-vessels until the uterus may become hardened and purplish in color and finally pale and anæmic.

Displacements of the uterus or inflammation of the surrounding tissues are not uncommon.

At the time of menstruation the congestion is intense and the retrograde changes do not take place normally and completely, and some enlargement or menstrual subinvolution remains. At each period the enlargement or development is greater, and, the retrogression or involution being imperfect, the uterus becomes permanently and progressively larger, until the formation of adult connective tissue or the menopause prevents the process, and sclerosis supervenes.

Prognosis.—The prognosis without treatment is not good, for the disease

runs a very chronic course and the uterus remains enlarged. If treated early and vigorously, a cure may be effected, although sometimes not without a sacrifice of the ovaries.

Treatment.—Mechanical causes—such as displacements, tumors, stenosis, etc.—should be removed. Inflammations about the uterus must be treated in order that their unfavorable influence upon menstruation shall cease.

Literature of '96-'97-'98.

In the ascending type of metritis—not that which begins at the cervix, but the variety which proceeds from a pyosalpinx—removal of the tubes alone will not cure the patient, but the uterus itself should be removed. Pilliet (*Progrès Méd.*, May 8, '97).

The uterus should be curetted, unless co-existing exudates or inflammations contra-indicate such an operation.

Literature of '96-'97-'98.

Curettage for hæmorrhagic metritis in the virgin successfully employed in three cases. In the first two cases—16 and 15 years, respectively—the curette brought away large masses of whitish fungosities, of a firmer consistence than is usually met with in the scrapings of hæmorrhagic metritis in married women; the uterus was afterward packed with iodoform gauze. In the third patient, a girl of 14 years, the curette removed grayish-white fungosities, of a softer consistence than in the foregoing cases. Blanc (*Loire Méd.*, No. 12, Dec. 15, '96).

The application twice monthly of a solution of zinc chloride not only benefits the endometritis, but tends to stimulate the uterus to contraction, and thus favors involution and diminishes the menorrhagia. It may be used as a primary method of treatment, or to follow up a curettage. Before each application the cervix should be slightly dilated with a round dilator. As this treatment is apt

to cause some pain for a few hours after its use, it should be followed by rest during the remainder of the day. A slight cauterization is produced by each application, and, if sufficient time be not allowed to pass between them, the patient will complain of more backache or pelvic discomfort than previously. In such cases the intervals must be lengthened or the treatment suspended for a few weeks.

Jequiry highly recommended in chronic granular metritis. The strength of the solution employed is 1 per cent. Borde (Archives of Gynæc., Sept., '91).

Literature of '96-'97-'98.

The following is useful in hæmorrhagic metritis:—

R. Fl. extract of ergot, 1 ounce.

Fl. extract of hamamelis,

Tr. cinnaom., of each, $\frac{1}{2}$ ounce.

M. Sig.: A teaspoonful every two hours. Chase (Med. News, June 19, '97).

Bipolar faradism or mild galvanism of the endometrium will sometimes reduce the uterus in size.

Intra-uterine electrolysis recommended as a treatment of metritis, a silver electrode being employed. Boisseau du Rocher (La Presse Méd., June 29, '95).

Tonics, laxatives, a midday rest in the recumbent position, etc., are indicated the same as for endometritis.

Literature of '96-'97-'98.

Deep scarification through the speculum relieves the engorged vessels and may abort or palliate the attack. Should pain be intolerable, a suppository of aqueous extract of opium, 1 grain, and extract of belladonna, $\frac{1}{8}$ grain, may be used. Curettage, if indicated at all, should be thorough. The steps of the operation are as follow:—

1. Anæsthesia.

2. Preparation of the vagina and external genitalia.

3. Dilatation of the uterus, unless it is already sufficiently open.

4. Removal of the infected endometrium by means of the sharp curette.

5. Thorough irrigation of the endometrium with cotton wound- on dressing- forceps and dipped in saturated solution of iodine crystals with pure carbolic acid.

Dilatation, curettage, and drainage of the endometrium in acute infection should be limited in its application. The only cases in which it should be performed are those which will otherwise result in dangerous spreading of the infection.

Curettage is contra-indicated in cases in which the infection has passed to the parametria. E. C. Dudley (Albert Lea Med. Jour., Dec., '98).

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METRORRHAGIA. See UTERUS.

MIDDLE EAR, DISEASES OF.—Over 60 per cent. of all ear diseases are in the middle ear. More adults than children (3 to 1) and more men than women are affected with diseases of this part of the organ of hearing.

Diseases of the middle ear are divided into four general classes; viz.: *acute catarrhal*, *chronic catarrhal*, *acute purulent*, and *chronic purulent otitis media*. All these begin as an acute catarrhal process, influenced, of course, by special conditions of health and diathesis in the patient. As a rule, the acute catarrhal process of the middle ear originates in an acute catarrh of the naso-pharynx and the Eustachian tube, whence it spreads to the middle ear, which in its normal state is an aseptic cavity. Sometimes it seems that the entrance of cold water, cold air, or some other irritant into the external auditory canal sets up an inflammation in the middle ear; but in such cases it will be found that the naso-pharynx was more or less inflamed and supplied the pathogenic germ to the drum-cavity, congested from disease in

the external ear, thus supplying a soil favorable to the growth of streptococci or other pathogenic organisms.

Acute Catarrhal Otitis Media.

Symptoms.—The earliest symptoms of this disorder are a sensation of stuffiness in one or both ears and hissing or pulsating tinnitus, but without pain and altered hearing. Sometimes, indeed, in the early stages the hearing may be hyperæsthetic. Most of us experience this mild stage of acute catarrhal otitis media with a cold in the head. As simple coryza passes off, all ear symptoms go with it, if the local treatment of the nares and naso-pharynx has been mild and gentle, or purely negative. If the conditions in our own naso-pharynxes and middle ears are closely observed when we have coryza we shall notice that, as secretion increases in the naso-pharynx (but not before), the Eustachian tube ceases to open at each act of swallowing as it does in a normal state. The ear may feel more or less stopped, and now and then there may be slight pain running into it from the posterior nares. If in these early stages the naso-pharynx, nares, and Eustachian tube receive no local treatment or only a mild one with a bland, oleaginous spray, we shall perceive that, as secretion in the nares and naso-pharynx diminishes, in the course of from three to six days, the Eustachian tube will open spontaneously (or with an act of swallowing) and the ear will feel clear once more. This stoppage of the Eustachian tube in the early secretory stages of an acute coryza is beneficial, since it is Nature's seal set against the entrance of pathogenic germs from the naso-pharynx into the normally aseptic middle ear. If this seal is broken, either by forcible blowing of the nose, Valsalvan autoinflation, or the inflation-bag of the surgeon it is done to the injury of the

patient, as pathogenic germs are very likely to be forced by such manipulations from the naso-pharynx into the middle ear and an acute purulent inflammation of the drum-cavity set up. Acute catarrhal otitis is as common as acute coryza, and as simple if properly managed; but the transition to acute purulent otitis, a serious malady, will be rapid if the local treatment of acute catarrhal otitis is injudicious.

Diagnosis.—If the membrana tympani be examined in the early stages of a simple acute otitis, it will be seen to have undergone very slight, if any, change. It may look a little pink or even red along the malleus and periphery. But its general surface undergoes no change in appearance or position.

Otitis is very frequent in the newborn and in sucklings. In 47 infants there were 37 cases of otitis,—bilateral in 28 instances. The appearances within the ear in this affection are infiltration and redness of the drum-head, often a projection of the posterior half of the membrane, and disappearance of the apophysis. In doubtful cases an exploratory puncture should be made.

The general and functional signs of otitis in the newborn and sucklings are restlessness at night, the frequent placing of the child's hand to the affected ear, the cry, and the symptoms of meningitis. Broncho-pneumonia is the most frequent cause of death (24 out of 37 cases). Hartmann (*Revue Men. des Mal. de l'Enfance*, Aug., '95).

Literature of '96-'97-'98.

The physical appearances of acute inflammation of the membrane in infants are usually of no help, for they are frequently absent, and as frequently as not the most that can be seen to be abnormal are the appearances, which show a closed Eustachian tube and perhaps some congestion of the vessels. The main symptoms we have to rely upon are pain and restlessness. W. Dalby (*Brit. Med. Jour.*, July 24, '97).

The following early symptoms suggest the ear as the cause of the illness in infancy: 1. The child constantly endeavors to rub the affected organ. 2. It utters a sharp cry of pain when pressure is made below the meatus. 3. It refuses to rest its head on the affected side. J. H. Marsh (Brit. Med. Jour., July 24, '97).

Etiology.—Acute catarrhal otitis media is caused most frequently by acute coryza. It is rarely, if ever, due solely to any form of inflammation of the fauces without concomitant nasal disease. It is also caused by the naso-pharyngitis excited in the exanthemata: typhoid fever and influenza.

Of 2000 cases of aural disease, 97 of the patients attributed the condition to influenza. The attic was exclusively or chiefly affected in a remarkably large number. In cases in which the inflammation was confined to the attic, Shrapnell's membrane was intensely congested and swelled, sometimes bulging in a sacular form. Kosegarten (Zeit. f. Ohrenh., Dec., '92).

Literature of '96-'97-'98.

Analysis of 1228 cases of typhoid fever showing that 28 were complicated with acute otitis media. Hengst (Amer. Laryng., Rhin., and Otol. Soc., Apr., '96; Arch. of Otol., May, '96).

Severe cases of measles rarely run their course without involvement of the middle ear; the inflammatory process usually runs its course without subjective, and often without objective, symptoms, and only occasionally perforation occurs. Pfingst (Pediatrics, Feb. 1, '98).

The acute otitis media coming on in about the third week of typhoid fever is due to the accumulation of secretions, food, etc., and the decomposition thereof in the naso-pharynx of the weak and recumbent patient. Sepsis is thus conveyed to the Eustachian tube and middle ear. An acute catarrh is set up in these cavities, and a simple catarrhal otitis media is soon followed by an acute suppurative otitis media.

Treatment.—All forms of inflation and aspiration of the middle ear, as also syringing and douching the nares and naso-pharynx, must be most carefully avoided, since all of these manœuvres tend to force pathogenic germs from the naso-pharynx into the middle ear. If the nares and naso-pharynx are full of tenacious secretions that the patient cannot gently blow from the nose, a moderate use of a spray of Dobell's solution, or simple fluid petrolatum, once or twice daily will soften these secretions and favor their outflow. But no inflations or aspirations of the naso-pharynx should be employed by which to open the middle ears. Both doctor and patient should be taught that the stopped condition of the ear or ears is a preventive of worse conditions in the ear, and must be cheerfully endured for a few days. Watery sprays must be avoided, as a rule, as they tend to "waterlog" the tissues and increase the swelling and discomfort in the nose.

The acute catarrhal otitis media of the exanthemata, of typhoid fever, or grippé originates also by infection from the naso-pharynx, but, owing to the more weakened condition of the patient in these maladies than in simple coryza, it tends to a more virulent course from the outset. Nevertheless, the simpler the local treatment of the naso-pharynx and ear in such cases, the less likelihood there will be of secondary infection, and the more favorable will be the course of the aural disease in the end. A mild, antiseptic nasal spray to cleanse the naso-pharynx in such cases will be sufficient.

Literature of '96-'97-'98.

Nasal or pharyngeal catarrh, whether idiopathic or symptomatic of measles or scarlet fever, is frequently complicated by acute middle-ear affections. The disease brings with it the necessity of freeing the nasal cavity at frequent inter-

vals; and the simple blowing of the nose, if violently or carelessly done, as is usually the case, may be a source of danger. It should be done as seldom as possible, as violent blowing only adds to the existing irritation and congestion. If this is not sufficient, the mucus must be made less consistent and removed by an alkaline douche. Fridenberg (*Med. News*, Aug. 8, '96).

At the very outset of an attack of any one of the exanthemata, the nose and naso-pharynx should be frequently and thoroughly cleansed. A spray with warm antiseptic saline solutions, alternating with a free use of medicated oily sprays containing, if necessary, suitable germicides, will usually be sufficient. W. C. Phillips (*Archives of Otol.*, Apr., '97).

If there is pain in the ear, it can be allayed best with dry heat applied by means of the hot-water bag, hot-water bottle, or hot stone wrapped in flannel. The endeavor to open the stopped ear and to relieve slight ear-pains by inflations, aspirations, and syringings has often converted simple catarrhal otitis media into the painful and serious acute purulent otitis media.

Simple catarrhal otitis media, even when painful, can be allayed by the simple application of dry heat about the ears, combining it, in those instances demanding it, with an antifebrile treatment of the general system, if this plan is pursued from the outset of the inflammation. There will be no harm in instilling into the ear, if it pains, 10 drops, *warmed*, of a solution of carbolic acid (1 to 40), or one of formalin (1 to 2000), if these can be borne.

Liquid vaselin, pure or mixed with iodoform, has given great relief to pain, in acute middle-ear inflammation, while it seemed to overcome any tendency to suppuration. Iodoformized vaselin was of especial service in cases complicating influenza. Delstanche (*Jour. de Méd.*, etc., June 18, '92).

One hundred cases of acute otitis media

treated by instillations of cocaine, 5-per-cent. solutions. Ninety-five per cent. of all the cases escaped suppurative inflammation. Five or 6 drops of the cocaine solution should be instilled as often as pain returns. A single medication, the meatus being closed afterward with cotton, will cause pain to cease within ten or fifteen minutes. Ordinary cases of acute otitis media will subside under two or three days of treatment, the drops being instilled about four or five times daily. Inflammation in the naso-pharynx must be treated also. Wolfenstein (*N. Y. Med. Jour.*, Nov. 5, '92).

Literature of '96-'97-'98.

For an acute attack of otitis media the indications are to relieve the pain and subdue inflammation. Both of these are best met by filling the canal with water, as hot as it can be borne, immediately applying a compress wrung out of hot water to the ear and side of head; or by the local use of extract of opium or solution of morphine or cocaine. These failing, opiates internally, combined often with salicylate of soda, or the coal-tar remedies may be used. If pain still continues and the membrane is found bulging from retained secretions in the middle ear, an incision should be made in the membrane. J. C. Workman (*Columbus Med. Jour.*, Feb. 18, '96).

In many cases of acute inflammation of the membrane, the use of leeches and hot fomentations will cut short inflammation of the tympanic cavity. Where they fail a vertical incision should be made in the posterior segment of the membrane. Even if no pus be present the incision will do no harm. W. Dalby (*Brit. Med. Jour.*, July 24, '97).

Applications of dry heat to the ear by means of salt-bags, bran-bags, etc., while valuable, lose much of their efficiency because the heat is applied too far away from the seat of disease. A dental instrument personally modified so that dry heat may be applied directly to the tympanic membrane. In otalgia of all kinds it is of great value in promptly relieving the pain. In the dry treatment of otorrhoea it is also of value, the ear being first thoroughly cleansed and the surface

then dried with the instrument. Van-sant (Jour. Amer. Med. Assoc., Oct. 2, '97).

The advantage of instilling an anti-septic into the inflamed ear, in the early stages *before* perforation of the drum-membrane occurs, is that the auditory canal is thus rendered, to a great degree, aseptic. Hence it is a safer place for the membrana to rupture into, since, when the membrana ruptures and the germs causing the acute inflammation are poured into the outer ear freed from staphylococci by antiseptic instillations, there is then less danger of the entrance of the last-named germs, the promoters of chronic purulency, into the drum-cavity, and secondary infection is less likely to occur.

Literature of '96-'97-'98.

Irrigation of the external auditory meatus recommended in all cases of scarlet fever or measles, with a solution of 1 in 1000 aqueous solution of corrosive sublimate, with 10 per cent. of added glycerin. R. H. Woods (Jour. of Laryn., etc., Jan., '98).

Acute Purulent Otitis Media.—Acute catarrhal otitis media, instead of undergoing resolution, may pass into acute purulent otitis media, induced by the passage of pathogenic germs from the naso-pharynx into the middle ear.

In all the various stages of inflammation of the middle ear three micro-organisms chiefly are found: the streptococcus, the different forms of the staphylococcus, and the pneumodiplococcus. Their paths of invasion are: 1. By the blood-vessels. 2. By the Eustachian tube, both directly and indirectly. 3. Through the drum-head. 4. The micro-organisms may also invade the middle ear from the cranial cavity, through the petrosquamous fissure. Moos (Deut. med. Woch., Mar. 12, '91).

Records of 100 cases of scarlatina collected. Otitis occurred in 125 cases, or

12.9 per cent. It was most frequent in very young children. Caiger (Lancet, June 6, '91).

The organism most potent in the etiology of the otitis media of scarlatina is the streptococcus pyogenes. The less chance there is of contamination from the outer air through the external ear, the more the pyogenic cocci predominate over the rod forms; but, prior to perforation of the membrana tympani, the occurrence of such organisms is not precluded, since they may ascend from the mouth and air-passages. Next to the streptococcus, the most important organisms are the staphylococci albus and aureus. Apparently the diplococcus pneumoniae of Fränkel or the bacillus pneumoniae of Friedländer does not play such an important part in the otitis media of scarlet fever as in that due to other causes. Braxall (Amer. Jour. Med. Sci., Sept., '95).

Case of acute suppuration of the tympanum after an operation on the vault of the pharynx. The case developed an acute inflammation of the attic, with grave cerebral symptoms. The operation within the pharynx consisted of the removal of an hypertrophied pharyngeal tonsil, which extended rather low along the posterior wall of the pharynx. Tansley (Arch. of Ped., Feb., '94).

Literature of '96-'97-'98.

Case of acute otitis complicated with mastoiditis following the surgical removal of adenoids from the naso-pharynx. This untoward result was largely due to the irrigations of the naso-pharynx carried out before and after the operation. Barr (Internat. Otol. Cong.; Ann. des Mal. de l'Or., etc., Jan., '96).

Fatal case of acute general infection with Friedländer's bacillus in a case of otitis media and empyema of the mastoid. Examination of the pus removed at the operation as well as that obtained at the autopsy, blood from various organs, and urine showed a pure culture of Friedländer's bacillus. Among pyæmias due to Friedländer's bacillus the meningial form occupies an important place. Brunner (Münch. med. Woch., Nos. 13, 14, '96).

Symptoms.—In acute purulent otitis media the pain becomes more intense, the hearing dull, tinnitus louder and distressing, and fever usually sets in if it be not already present. The membrana tympani will be found congested and its features lost in the general swelling of its surface as the inflammation within the drum-cavity advances.

Literature of '96-'97-'98.

In middle-ear inflammation in early infancy in slight cases there is restlessness, ill humor, loss of appetite, and, in severe cases, the rolling of the head from side to side, sleeplessness, calling out, continuous crying, vomiting, and a discharge of pus. In weakly children the loss of weight is often the most striking symptom. In the most severe cases the temperature may rise to 104° F., or over, and depression almost amounting to unconsciousness, twitchings, and convulsions may, in a short time, lead to the development of the appearances characteristic of meningitis, all of which may disappear at once on the occurrence of otorrhœa. Very frequently there is swelling, with tenderness of the lymphatic glands around the ear, and preauricular œdema. Gomperz (*Jour. of Laryn.*, Apr., '96).

In children under four years of age great confusion in diagnosis often arises in the presence of a gastro-enteritis, symptoms of which may be mingled with those of an acute otitis media, or which may depend more upon the otitis media than upon the gastro-enteritis, though the otitis media may not be recognized promptly. Often, in fact, the latter disease is discovered accidentally, either by observing a discharge from the ear and improvement in the symptoms of the gastro-enteritis or by touching the auricle or the region near it, when the latter is found to be tender and painful to the touch. Treatment of the ear will be followed by recovery in all respects, in most instances, if the aural treatment has not been deferred too long. E. Ponfiek (*Berliner klin. Woch.*, Sept. 20, '97).

Treatment.—In this form of otitis, as in the former, dry heat about the ear will do the most in allaying the pains and sometimes in causing resolution. Warm water or warmed watery solutions of carbolic acid (1 to 40) may be tried, but, as has been said, they may afford little or no relief, though the latter sterilizes the auditory canal and prepares it for either a spontaneous or artificial perforation of the drum-membrane.

Literature of '96-'97-'98.

In acute suppurative otitis media, previous to rupture of the membrane, leeches are applied over the mastoid and in front of the tragus to relieve pain. These are supplemented by warm, wet cloths, which promote bleeding. Instillations of morphine, 2 grains to the ounce, or a 10-per-cent. solution of cocaine, are dropped into the ear if necessary. When ear-drops are used they are warmed by first dipping the spoon that is to contain them in hot water, and then pouring a small amount into the meatus. When the acute symptoms have subsided the ear is kept clean by syringing with a lotion composed of boric acid, 10 grains, to 1 ounce of water. For a time, daily inflation with the Politzer bag is practiced. F. C. Ewing (*Jour. Amer. Med. Assoc.*, Feb. 29, '96).

Case of facial paralysis which attended on an attack of acute otitis media, persisted in spite of revulsive and antiphlogistic treatment, but completely disappeared on the performance of paracentesis. Damiano (*Ann. des Mal. de l'Or.*; Treatment, June 23, '98).

Inflations, aspirations, etc., must be carefully avoided now, as in the acute catarrhal form, for fear of forcing the pathogenic germs from the middle ear into the antrum and mastoid cells. In fact, in this way the large number of cases of so-called acute mastoiditis consecutive to acute otitis media are caused. The naso-pharynx may be sprayed, not syringed, with Dobell's solution, in such cases, if the nares are filled with tough

secretions; not otherwise. Ordinary gentle blowing of the nose will be quite sufficient to clear the nostrils. Under the above conservative treatment the earache usually ceases in a few days, either with or without spontaneous rupture.

Inflations by either Politzer's method or the catheter or any other method is not only useless, but really dangerous in acute otitis media, as by such means pus may be forced into parts of the middle ear previously unaffected. Walb (*Archiv f. Ohrenh.*, Sept., '95).

Inflation in acute otitis media should not be employed, and the wound should not be irrigated after mastoid chiseling. Hartmann (*Archiv f. Ohrenh.*, Sept., '95).

If pain continues over six hours in a child or twelve hours in an adult, without spontaneous rupture of the membrana tympani, paracentesis of the membrana should be performed, because not only hearing, but life itself, may be at stake in many cases if the drum-membrane is not opened in some way. As the inflammation advances the membrana tympani will be seen to bulge, especially in its posterior half. Sometimes the most prominent portion, however, is in the membrana flaccida. As the inflammation in the drum-cavity increases, the pain becomes most intense, children being thrown into convulsions in some instances, and adults made to writhe and scream with pain. After secretion forms in the drum-cavity and the membrana bulges, no relief can be obtained until an escape is offered to the pus by either a spontaneous or an artificial opening in the drum-membrane. In time, a spontaneous opening will occur; but, as the tendency is for secretion inside the drum-cavity to inspissate, the longer perforation is deferred, the less likely it is to occur spontaneously, and then the retained secretions will burrow toward the meninges, sinuses, and brain-

cavity, especially in children. Hence the vital indication is prompt paracentesis in a case of acute otitis media with the membrana still imperforate after a few hours of great pain followed by bulging of any part of the membrane.

Having sterilized the auditory canal and membrana tympani and illuminated these parts by means of the ordinary forehead-mirror, if the patient is not etherized, an incision must be made in the most prominent part of the membrana. If the patient is etherized an



Fig. 1.



Fig. 2.

Paracentesis-knife and adjustable handle.

electric head-lamp, referred to farther on, must be employed, as an open flame must not be brought near the patient. If daylight can be used, no artificial light is needed. For performing paracentesis, or, rather, for incision of the membrana, a knife like that shown in Fig. 1 may be employed. Some prefer a knife the shaft of which is set at an angle to the handle, like the one in the illustration, while others prefer, for all operations of the membrana, a straight instrument. An incision 1 to 2 millimetres, or even 3 millimetres, long is far preferable to a

mere puncture with the so-called paracentesis-needle, as such an opening is not sufficient for drainage.

Before puncturing the membrane, the external auditory canal should be rendered aseptic by cleansing it with cotton pledgets moistened in 1 to 1000 solution of sublimate, or 1 to 50 solution of phenic acid. Anæsthesia is produced by a 1 to 5 solution of cocaine hydrochlorate. The point in the membrane to be punctured should be in the postero-inferior quadrant. Mounier (*Ann. des Mal. de l'Or., du Lar., du Nez, et du Phar., Oct., '92*).

Literature of '96-'97-'98.

In the last five years 214 cases of acute influenza-otitis observed. In 64 of these the attic, or pars epitympanica of the drum-cavity, was chiefly affected. The treatment consisted in paracentesis when spontaneous rupture of the membrana did not occur promptly. Haug (*Arch. f. Ohrenh., May, '96*).

In acute otitis media in young infants paracentesis is necessary, followed by the use of Politzer's bag and evacuation of the pus. G. P. Field (*Brit. Med. Jour., June 12, '97*).

Recovery ensues sooner in cases in which paracentesis has been performed than in those in which the perforation is spontaneous.

In a case of earache with congested and bulging drum-membrane the surgeon must be careful to differentiate between simple swelling of the outer surface of the membrana as occurs in so-called myringo-dermatitis and bulging of the membrana from the outward pressure of secretions on its inner surface. In the former the prominence is generally more punctate and sharply defined, often being, in fact, a yellowish, brownish, or livid bulla. In otitis media the protrusion from retained secretions comprehends more of the surface of the membrana, especially in its lower and posterior portions.

Literature of '96-'97-'98.

Case of pure myringitis. Examination of a child revealed a normal external auditory canal, but the drum-head was intensely red and swelled. There was great pain in the affected ear, and the patient had slight fever. Paracentesis was performed, but no discharge could afterward be forced into the canal by inflation with Politzer's air-bag. Eitelberg (*Arch. f. Kinderh. vol. x, H. 1, '98*).

In both forms of acute otitis media, the condition of the membrana tympani must be watched carefully and constantly throughout the progress of the disease, because only by an intelligent observation of its varying conditions can its treatment be properly conducted.

After either spontaneous or artificial perforation of the membrana there is usually a free discharge of muco-pus, and a cessation of pain, especially after prompt spontaneous opening of the membrane. If this has not occurred and paracentesis has been obligatory, the inspissated secretions escape more slowly at first and the pain gradually diminishes. After any form of perforation of the membrana in acute otitis media a discharge must be regarded as beneficial, as it carries off pathogenic germs. Therefore little or no local treatment of the ear should be applied for fear of secondary irritation of the outer ear and the perforation of the membrana. If this latter condition is established the escape of secretion from the middle ear is prevented, secondary infection of this cavity ensues, and chronicity of the purulency is imminent with mastoid complications. Hence the outflow of pus from the acutely-inflamed ear must be favored. The ear should not be syringed at all at such a time, unless the discharge is very thick and not escaping readily. The time to syringe the ear is before discharge sets in, in acute cases, for reasons already given,

and not afterward, for fear of secondary irritation of the perforated membrana and infection of the drum-cavity.

In any case of acute purulent discharge, once in twenty-four hours is quite often enough to syringe the ear. Let the ear run and drain itself through the natural drainage-tube: the external auditory canal. Keep the concha and meatus greased with cosmolin to prevent chapping, and mop with sterilized cotton or gauze (do not swab) the meatus and concha as they get filled with secretions. At the same time all forms of inflation, aspiration, and syringing of the nares and naso-pharynx must be avoided. Under these conservative and rational procedures the ear will return to its normal condition in the course of two or three weeks, in most instances.

Literature of '96-'97-'98.

Camphorated salol employed with advantage in chronic purulent otorrhœa of children. Campo and Compaired (First Spanish Oto-Rhin. Cong., Nov., '96).

Good results obtained in the treatment of chronic suppurative conditions of the middle ear from the employment of acetanilid or antifebrin as a dusting-powder. It is best used in combination with equal parts of boric acid. The ear should be cleansed in the ordinary way, and then a fine layer of the combined powders insufflated upon the part. Lewis Somers (Med. News, Apr. 4, '96).

Pyrozone and dilute hydrochloric acid of value in the treatment of chronic suppurating inflammations of the middle ear.

Ten drops of a mixture of 10 drops of dilute hydrochloric acid and 1 ounce of pyrozone should be put into the ear three times a day after cleansing it; the mixture should be left in for five minutes after having been forced in deep by firm pressure upon the tragus. In the primary stage of acute cases such medication is contra-indicated, but, after pain, throbbing, and swelling have subsided, and

suppuration continues, notwithstanding ordinary treatment, the acid and pyrozone check it very promptly. W. Cheatham (Med. Rec., Sept. 12, '97).

Of course, the general health and strength must be regarded and improved in this as in all forms of otitis media. The nares and naso-pharynx may demand either moderate spraying with Dobbell's solution once or twice in twenty-four hours, or with fluid cosmolin in which a few minims of eucalyptol or a grain or two of menthol are suspended. Oily sprays as well as watery sprays should be used sparingly, three puffs of the atomizer in each nostril being sufficient at an application.

Acute Empyema of the Mastoid.—

As has already been said, acute mastoiditis consecutive to acute otitis media in a previously healthy ear is usually, perhaps always, the result of improper management of the primary otitic affection.

Literature of '96-'97-'98.

A large percentage of cases of mastoiditis are the direct result of chronic purulent otitis media, but they are not produced in proportion to the frequency of the latter, and, therefore, there must be some existing condition or conditions that exert an influence in this direction.

E. O. Sisson (Jour. Amer. Med. Assoc., Apr. 23, '98).

In every case of acute purulent otitis media there is, in all probability, an attendant empyema of the so-called mastoid antrum. It ought to be called the tympanic antrum, as it is really a part of the tympanic cavity. Sometimes the antrum communicates with the mastoid cells, and hence it has received the name of mastoid antrum. When this cavity participates in the tympanic inflammation and becomes filled with secretion like the rest of the drum-cavity, it will

clear itself as easily as the drum-cavity does after an opening occurs in the membrana tympani. This fortunate result in drainage is assured by a siphonic action which naturally sets in as soon as either spontaneous or artificial opening of the drum-membrane occurs and the outflowing current of secretion is established, as anyone familiar with the regional anatomy of these parts must see upon reflection.

If, however, secondary infection of the perforation in the membrana and of the drum-cavity beyond takes place by infectious treatment through the external ear, secondary infection of the antrum takes place and the patient is then in the first stages of acute mastoiditis. If the antritis is not speedily relieved, the suppurative process may descend into the true mastoid cells, or inward toward the lateral sinus, or forward toward the tegmen tympani and thence into the middle cranial fossa. Sometimes all of these unfortunate lesions occur in the same case. My experience has been that, if an acute otitis media is treated properly from the outset, consecutive mastoiditis will not occur.

Mastoiditis is a most frequent complication of otitis due to influenza. The main points of difference between the mastoid inflammation of simple otitis and that caused by grippe are in the rapidity of involvement to be noted in the latter case and the destructive course of the disease. Adam Politzer (*Ann. des Mal. de l'Or.*, etc., May, '92).

Case of mastoid disease following an operation for the removal of adenoid vegetations. Patient eventually recovered. The aural inflammation may have resulted from the use of the carbolic-acid solution, which was syringed through the nares as an antiseptic wash after the operation. Editorial (*Boston Med. and Surg. Jour.*, Sept. 15, '92).

In 16 cases of mastoiditis resulting from simple acute otitis media, the diplo-

coccus pneumoniae appeared in 9, the streptococcus pyogenes in 5 (once with the staphylococcus pyogenes albus), the staphylococcus in 1, and a coccus of uncertain classification in 1 case. In uncomplicated cases of otitis media, the streptococcus pyogenes, and next in frequency the staphylococcus is most commonly present. Arno Scheibe (*Zeit. f. Ohrenh.*, Apr., '92).

Literature of '96-'97-'98.

Case of acute mastoiditis following acute otitis media, productive of extradural abscess in a man aged 50 years. Entire recovery ensued upon opening the mastoid and draining the extradural abscess. There was entire absence of fever during the entire course of the disease. Pain and swelling in the mastoid, with cerebral symptoms, led to the exploration and operation. Hennebert (*Ann. des Mal. de l'Or.*, Jan., '98).

Symptoms. — If the surgeon is confronted with mastoid empyema in the first or second week of an acute otitis media, he will generally find three prominent symptoms, viz.: pain, prolapse of the upper posterior wall of the canal near the membrana, and pyrexia. The pain is usually in the mastoid region, or on the same side of the head as the aural inflammation, and sometimes there is also earache, being either a continuance of the original earache or a return of it. There may or may not be tenderness on pressure upon the mastoid. If the latter occurs it is said to be usually near the point of the process; but this is not so at first. As the acute mastoiditis is ushered in by acute antritis, if there is mastoid tenderness on pressure at this time it is found over the region of the antrum: *i.e.*, high up and in the front part of the mastoid region close behind the auricle. If acute antritis has taken place and an incipient mastoiditis is before us, we shall find, in addition to pain in the mastoid, a prolapse or prominence

of the skin of the upper, posterior wall of the auditory canal, near the drum-membrane over the position of the antrum. If these two symptoms are present, the third one of the pathognomonic symptoms named above, fever, will also be observed.

Elevation of temperature, though slight, combined with tenderness on pressure over the mastoid process, in a case of acute otitis media of ten days' standing, is characteristic of mastoid disease. Pressure should always be made on both mastoids, however, as occasionally such pressure causes pain in a healthy mastoid. Bulging of Shrapnell's membrane, with drooping of the posterior and upper cutaneous lining of the external meatus, are absolute symptoms of mastoid involvement, and in such it is always necessary to perforate the mastoid cells. If mastoid symptoms, pain, etc., in connection with chronic purulent otitis media, do not yield to local and general antiphlogistic remedies, there should be no hesitation in making an exploratory opening in the mastoid. Bacon (*Trans. Amer. Otol. Soc.*, vol. vi, pt. 4).

Treatment. — The presence of acute empyema or acute consecutive mastoiditis in a case of acute otitis media being established, the surgeon must proceed to open the antrum. Many such cases go on to spontaneous rupture of the outer bony wall of the mastoid and entirely recover, like any other spontaneously evacuated abscess. But, considering the position of a mastoid empyema, so near the cranial cavity, it is not wise to await many days for spontaneous opening, because such an escape of pus from the mastoid may take place on its inner, nearly as probably as on its outer wall. Many cases of mastoid empyema are relieved by spontaneous rupture of the outer cortex, and doubtless many such occurrences are anticipated by a hurried mastoid trepanation. But, with the three symptoms—pain, prolapse, and pyrexia—manifesting

themselves in a given case, it is imperative on the surgeon to open the antrum. At such a point in the disease the mastoid skin-surface may present no abnormal appearance, and the surgeon must operate on the indication of the three symptoms or of the pain only.

If a minute fistula in the mastoid cortex should be found after exposure of the surface, this should be followed preferably to making the antral opening at once. The patient being etherized, an incision should be made, running from just behind the temporal artery, half an inch from the attachment of the auricle, around and behind it to the tip of the mastoid process, and the soft tissues retracted, backward and forward, so as to expose the mastoid especially at its upper, anterior position where it merges into the bony auditory meatus, at the so-called suprameatal triangle. The surgeon should proceed to make an opening with a grooved chisel and hammer (never with a trephine), working forward and inward and a trifle downward at first, until he is well under the traces of the zygoma. Ordinarily the antrum will be reached 2 to 3 millimetres beneath the surface of the bone, though at times it has been necessary to penetrate 6 millimetres before reaching the antral cavity. This opening in the bone should be funnel-shaped, with its mouth outward, and growing narrower as the antrum is approached. By making it of such a shape the cranial cavity is avoided above and the facial canal below. The antrum will be found in such cases to contain pus, and there may be also a few granulations found in it. If the case has been operated upon early in the attack, the quantity of pus will be small; if late in the disease the pus will be found in larger quantity and deeper, often lying against the sinus or over the region of

the labyrinth. If the bone over the sinus and over the region of the labyrinth is intact, removal of the pus by gentle lavage from these localities and from the middle ear will be next in order. Granulations especially on the inner wall of the antrum and mastoid cavities should not be disturbed: curettage of these may excite inflammation of the labyrinth or of the sigmoid sinus. If undisturbed they will heal rapidly with the rest of the abscess-cavity, as in any other form of abscess. After lavage of the wound-cavity with an antiseptic, an endeavor should be made to promote healing by first intention. If this is not attained, then, under daily syringing the ear and the operation tract with a bichloride solution (1 to 5000 or 6000), the ear gets entirely well in six weeks at the latest. The ear generally ceases to run before the mastoid wound does, and the hearing begins to improve and is finally often as good as before the ear became inflamed. The mastoid wound in favorable cases gradually closes from the bottom and is healed, as said already, in a few weeks.

If, before the antrum and mastoid have been opened, their inner walls have become diseased and the cranial cavity invaded, the surgeon is confronted with the most serious and often the most puzzling of all affections, viz.: intracranial suppurative lesions of otitic origin. These last-named diseases are more likely to occur as sequels of chronic purulent otitis media, but they not infrequently follow close upon acute purulent otitis media, especially when the treatment of the primary otitis has been an irritant one and secondary infection has been brought about thereby.

Mastoiditis with Spontaneous Perforation of the Medial Plate of the Process.
—In some instances of mastoid em-

pyema spontaneous perforation of the medial plate of the process occurs, and pus is poured into the digastric furrow of the bone beneath the insertion of the sterno-mastoid muscle. The pus thus liberated from the mastoid cells may find its way, either forward along the tract of the digastric muscle, and point in the pharynx, or backward, toward the nucha,—but beneath the deep fascia of the neck in both instances. This form of acute mastoiditis with spontaneous perforation of the medial plate of the process when it takes place usually occurs in connection with an acute otitis of the middle ear, and has been termed “Bezold’s mastoiditis,” because Bezold, of Munich, recently recalled professional attention to it.

Symptoms.—After pain has lasted for several days or even weeks, in a case of acute otitis media, the pain in the ear and mastoid may suddenly diminish or cease entirely, the otorrhœa continuing nevertheless. The mastoid process may or may not have been entirely free from external symptoms; usually, however, it is free from objective symptoms in this form of mastoiditis and remains so. Within twenty-four hours of the cessation of pain in the ear and in the mastoid there will be noticed a brawny swelling beneath the mastoid process, extending sometimes both behind and in front of the insertion of the sterno-mastoid muscle, but generally only behind and below the process with a tendency to extend below and backward toward the region of the splenius muscle. Pressure upon these brawny swellings beneath the mastoid may not be very painful, but by such pressure pus can be forced upward, through the spontaneous opening in the mastoid process, through the mastoid cells, antrum, and middle ear, and out into the external

auditory canal. A patient in this condition usually shows pyæmic symptoms, and will require an operation for the free escape of the pus now burrowing in the deep, soft tissues of the neck.

Literature of '96-'97-'98.

In making a diagnosis of Bezold's mastoiditis the presence of a swelling below the tip of the mastoid and the almost constant integrity of the outer table of the bone are points of importance, while, on making pressure over the neck-muscles, pus escapes by the meatus, or even from the antrum, if this cavity has been exposed by operation. Luc (*Arch. Intern. de Lar.*, Jan., '96).

Treatment.—The mastoid process is laid open and a counter-opening is made in the neck at the most prominent part of the inframastoid tumefaction, where-upon recovery will ensue. In some cases only the counter-opening in the retro-mastoid swelling, without opening the mastoid bone, already spontaneously perforated, will be required and speedy cessation of all the aural and nuchal symptoms, with recovery of the hearing, will take place, just as it occurs after prompt incision into an extramastoid suppuration consecutive to spontaneous opening of the mastoid cortex behind the ear and over the outer mastoid surface.

In some cases of Bezold's mastoiditis in which general mastoid symptoms—as pain, tenderness, swelling, redness, etc.—demand it, before the counter-opening is made in the neck to relieve the gravitation-abscess, the outer mastoid cortex is to be opened, the cavity exposed, and the passageway of the pus, through the medial plate of the process, and the direction of the sinus into the neck are to be sought with a probe, and a counter-opening in the neck made accordingly. If the counter-opening in the neck is made promptly,—*i.e.*, as soon as any

symptoms of burrowing of pus in the neck-tissues show themselves,—quick recovery ensues. But delay in operating in such cases is generally followed by septicæmia, and sometimes death.

The after-treatment of the wound-cavities in an uncomplicated case of Bezold's mastoiditis with burrowing into the neck is to be conducted on general antiseptic surgical principles.

I have found that, in all cases of spontaneous perforation of the mastoid with discharge of pus beneath the soft tissues, whether the simple form or the Bezold form of mastoiditis, after free incision in the soft parts and escape of pus, especially if fluid syringed either through the ear or through the wound escapes at the opposite end of the suppurating tract, healing takes place promptly under one daily syringing of the tract with a solution of bichloride (1 to 6000) without any trepanation of the mastoid.

Chronic Catarrhal Otitis Media.—

Acute catarrhal otitis media, instead of undergoing resolution or resulting in acute suppuration, may pass into a chronic, hypertrophic, catarrhal otitis media. In such cases it will be found that the naso-pharynx has become the seat of hypertrophic catarrh.

Literature of '96-'97-'98.

From a study of 600 cases of middle-ear disease the following conclusions have been reached:—

1. Sclerosis of the middle ear is usually the result of previous nasal or pharyngeal disease.
2. Otitis media suppurativa is a common and frequent result of acute or chronic naso-pharyngeal disease.
3. Fully 75 per cent. of all forms of middle-ear disease will show on examination or give a history of naso-pharyngeal disease.
4. Sixty-four per cent. of tympanic affections are coincident with patholog-

ical changes either in the nares or pharynx or both.

5. Sclerotic or atrophic changes of the naso-pharynx are of little consequence in the production of deafness as compared with chronic hypertrophy or any morbid change producing congestion of the nose or throat.

6. Of nasal affections, hypertrophy of the turbinals is the most potent factor in the production of aural disease.

7. Aural affections are more frequent in hypertrophies of the post-nasal space or naso-pharynx than in either pure nasal or pharyngeal disease.

8. The effects of passing disease of the nares or pharynx in the production of middle-ear disease is of much importance.

9. General diseases, such as measles, with local naso-pharyngeal manifestations, exert a marked causative influence in the production of middle-ear disease.

10. To a great extent the successful issue of aural disease depends upon appropriate naso-pharyngeal treatment. L. S. Somers (Univ. Med. Mag., Aug., '97).

Symptoms.—The onset of this form of otitis is gradual; hence it has been called chronic progressive hardness of hearing. After an attack of acute catarrhal congestion of the middle ear the ear may not return to its normal state, but remain the seat of more or less tinnitus and of a stopped feeling. The hearing at first is but little impaired, which leads the patient to disregard his ear disease, thinking it will pass off, especially if the impediment is confined to one ear. However, with every cold in the head the ear feels worse and after each cold the noises in the ear and the hardness of hearing increase and are noticed more and more by the patient and his friends. As the symptoms of tinnitus and deafness increase there may be added attacks of ear-vertigo—sometimes called Ménière's disease. These attacks come on suddenly, occurring once or twice a year at first, and are usually not referred

to the ear as a cause either by the patient or his physician. In fact, they are commonly considered and treated as attacks of stomachic vertigo or neurasthenia. In some instances the attacks of ear-vertigo are preceded by an increase in the tinnitus aurium, and this may arouse *in the patient* a suspicion that the *ear disease* is the cause of his vertigo. When chronic ear-vertigo sets in, it is in the later stages of chronic catarrhal deafness, and the deafness is generally profound in the ear or ears affected. In every case of chronic catarrhal otitis media there is, very early in the process, contraction of the tensor tympani, retraction of the chain of auditory ossicles, and consequent impaction of the stapes in the oval window. It is this last event that causes compression of the intralabyrinthine fluid, irritation of the motor filaments of the auditory nerve and cerebellar peduncles, with reflex phenomena of vertigo.

If these attacks of ear-vertigo once set in, they gradually increase in frequency from once in six months to once a month and finally once a fortnight. As the patient suffers from nausea and vomiting, as well as inability to walk steadily, or even at all, and as he may be seized by vertigo and reeling in the street and mistaken for a drunken man, he is unwilling to leave the house alone. His business is interrupted, his nervous force gives out, and his general condition becomes deplorable. Unfortunately, he is often treated now for "neurasthenia," "epilepsy," and even "apoplexy" instead of ear-vertigo. The fact that a patient with ear-vertigo never loses consciousness in his attacks serves to render the differential diagnosis positive.

Treatment.—Since chronic catarrhal otitis media is caused by chronic hypertrophic naso-pharyngeal catarrh, and

not by throat disease, the naso-pharynx must receive the first attention and the general health improved—if impaired, as it generally is. The treatment of the nares must be non-irritant, otherwise the ear disease will get worse. Oleaginous sprays are much better than watery sprays, since the former do not “water-log” the tissues like the latter.

Inflations of the tympana are not only valueless, but often injurious, as they but tend to force pathogenic germs into the middle ear, and shock the auditory nerve by impact upon the fenestræ of the internal ear.

The condition of the nares being improved, gentle pneumomassage of the membrana tympani and (mediately) of the ossicles, will be beneficial. This is best accomplished by the Siegle pneumatic speculum, applied under direct inspection of the membrana by the surgeon. There are other forms, but they are likely to be too rough.

Excellent results are often produced by gentle treatment of chronic catarrhal otitis media as outlined above, continued 2 or 3 times weekly for several months, whereas under vigorous treatment by strong sprays, phonomassage, and numerous inflations of and local applications to the naso-pharynx and middle ear, all the symptoms—tinnitus, deafness, and vertigo—increase. In no case will applications to the external ear and membrana do anything but harm.

If, in spite of rational, conservative, non-irritant treatment of the naso-pharynx, and gentle pneumomassage of the membrana, the ear-symptoms grow worse, resort may be had to removal of the incus. The resultant overcoming of the retraction of the chain of ossicles, and consequent liberation of the stapes, will be followed by diminution and final

cessation of the tinnitus and vertigo, and in some cases, by improved hearing.

The instruments required for performing tympanotomy and ossiculectomy are an electric head-lamp, held on the head by means of a band similar to that of the ordinary forehead-mirror, as shown in Fig. 3 and by a set of instruments similar to those shown in their natural size in Figs. 4 and 5.

In performing removal of only the incus the patient must be etherized, the membrana and auditory canal sterilized, and, by means of a knife shown in Fig. 4, *B*, an incision made in the upper

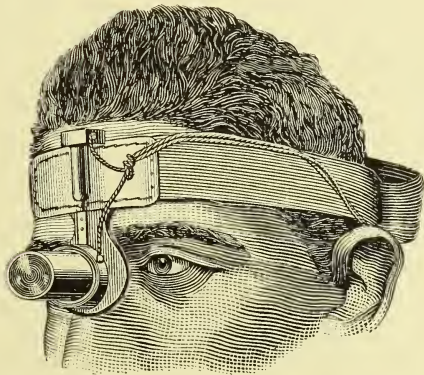


Fig. 3.—Electric forehead-lamp.

posterior quadrant of the membrana, and the incus-stapes joint exposed. The incus must then be detached from the stapes by means of traction outward and downward with the incus hook-knife (Fig. 4, *D*). The descending ramus of the incus must then be seized with forceps (Fig. 5) and gently pulled downward and outward through the perforation of the membrana into the auditory canal and removed from the ear. The meatus should then be stopped with a loose tampon of sterilized gauze and let alone for twenty-four hours. Healing by first intention usually occurs, if the

ear is protected with dry sterilized gauze and let alone. Removal of the incus is never followed by inflammatory reaction if the above-named conservative treatment is carried out. If anything is applied to the wound in the drum-mem-



Fig. 4.—A, Blunt-pointed knife. B, Knife for initial incision. C, Curved knife for tenotomy of tensor tympani; two-edged. D, Incus hook-knife.

brane or to the middle ear, inflammatory reaction will surely occur.

Conclusions drawn from personal experience in sixty cases of stapedectomy during the past two years: 1. That the best results in hearing have been obtained in cases of early removal of the bone, and that this operation is of little use in cases of otitis media insidiosa (sclerosis). 2. That cases of chronic aural vertigo have been permanently relieved by liberation of the stapes or by extraction of the bone itself. 3. That in cases of non-suppurative disease of the middle ear, as well as those resulting from a chronic suppurative process, surgical mobilization should first be tried before an attempt is made to remove the stapes. 4. That most operations for mobilizing the stapes or freeing the oval window must be looked upon as largely experimental, and that in many cases a fracture of the crura occurs at the time of attempted extraction, leaving the base-plate. Jack (Boston Med. and Surg. Jour., Jan. 10, '95).

Literature of '96-'97-'98.

Case showing the permanent benefit from excision of drum-head and malleus

on right side for deafness and tinnitus arising from progressive catarrhal inflammation of the middle ear. A. H. Smith (Med. Rec., Jan. 25, '96).

Operative interference is not beneficial in cases of sclerosis. The cases which appear to give the best results are those in which the drum is markedly retracted and changed, the fixation being more or less limited to the membrane itself and to the larger ossicles. A. H. Cheatele (Practitioner, May, '97).

Chronic Purulent Otitis Media.—

Chronic purulent otitis media is due to the permanent lodgment of staphylococci in the acutely-inflamed middle ear. This unfortunate result is usually brought about by improper treatment of the acute otitis media, generally by the patient, but sometimes, it must be admitted, by his physician.

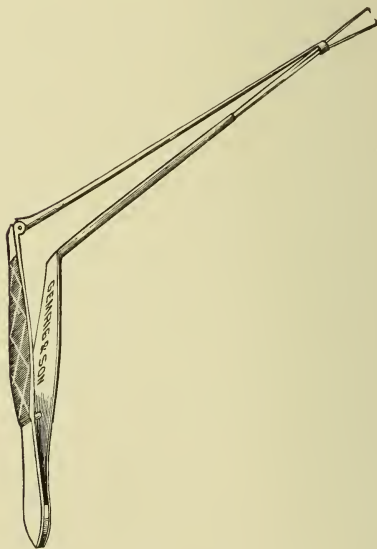


Fig. 5.—Sexton's foreign-body forceps.

Analysis of 300 cases of suppurative otitis media chronica. Of these 300 cases, 72, or 24 per cent., resulted from scarlatina; 27, or 9 per cent., followed measles; 37 cases were due to naso-pharyngeal catarrh; 4 cases resulted from blows on the ear; 11 cases originated during the first dentition; 7 cases were due to tubercular

disease of the mucous membrane; 3 cases developed after the entrance of salt water into the ear; 1 case originated during an attack of pertussis; 137 cases are recorded as resulting from "colds in the head." Milligan (*Med. Chronicle*, Sept., '91).

Symptoms.—The symptoms of this condition are objectively a perforated membrana and more or less copious and offensive discharge from the ear. This hole in the membrane varies from the size of a pin's head to that of the entire membrana.

The membrana loses its lustre first, and sooner or later becomes thick and red, denuded and secreting. When the perforation is large all the ossicles may be visible. Or the malleus, the manubrium being partly destroyed by caries, may be the only one visible. The incus is generally the first to go in part or entirely, as its nutrition is poor.

The stapes is the most resistant of all, especially in its foot-plate, as it is nourished by the vascularity of the inner wall of the tympanic cavity, of which it is practically a part. The head and crura of the stapes may be destroyed by necrosis in some virulent cases. But, as a rule, it persists the longest of the three bonelets, though it may remain invisible through the perforated membrana, because buried in the swollen mucous membrane of the drum-cavity. As this swelling goes down under treatment and the discharge ceases, the stapes comes into view, if still intact. The subjective symptoms of chronic purulent otitis media are hardness of hearing, deafness; tinnitus of more or less intensity, either constant or interrupted; ear-vertigo at times in adults, and in children attacks of so-called "gatherings in the ear," and earache with, of course, impaired hearing and, sometimes, tinnitus. Adults, too, will have attacks of earache if they

allow cold water or cold air to enter the diseased ear, or if they neglect a cold in the head.

Treatment.—The first endeavor should be to render the external auditory canal and middle ear aseptic. Of course, cotton must never be worn in the chronically-running ear. If the discharge is too thick and too copious to mop out, it may be syringed out of the ear by means of warm water previously boiled. To this may be added a little salt, carbolic (1 to 40), or equal parts of alcohol. Once or twice in twenty-four hours is often enough in the worst cases. If the discharge is not copious it may be removed with an absorbent-cotton mop, previously singed, and then 10 drops of an antiseptic solution may be put into the ear. A solution of formalin (1 to 1000 or 500) or a solution of carbolic acid (1 to 40) may be dropped in, and allowed to lie there a few minutes, and then turned out on a towel. Where there is a tendency to granulations absolute alcohol may be used instead of the above. This treatment may be repeated once or twice a day in the worst cases, then once a day and finally every second or third day, as the discharge lessens. This or a similar conservative antiseptic treatment, persevered in for many months, will usually lessen the discharge and in many cases check it, especially if the perforation of the membrane is below the folds and the disease largely or entirely in the lower part of the drum-cavity, or atrium. If the sole perforation is in the membrana flaccida, and the purulency chiefly or entirely in the attic, or recessus epitympanicus, it cannot be cured, as a rule, by local antiseptics.

Literature of '96-'97-'98.

Instillation of 10 drops, two or three times daily, of a mixture of dilute hydro-

chloric acid, 10 drops, with 1 fluidounce of pyrozone found to effect a cure of chronic suppuration of the middle ear, even in attic complication, in a short time. W. Cheatham (Med. Rec., Sept. 12, '96).

The disease being limited to the atrium and the perforation being generous, local antiseptics will often effect a cure. The surgeon must persevere for months and even years with such treatment, if he observes that the tendency of the purulency is to lessen, and the condition of the diseased mucous membrane of the drum-space improves. If the purulency ceases under local antiseptics, the hearing may be found to be less after the discharge ceases than while it prevailed. This is due to the fact that in the healing process the partially-destroyed ossicles and membrana tympani have been bound together against the promontory and oval window, by synechia, and sound-conduction thus impeded. When the largest ossicles are destroyed by necrosis or removed by the surgeon, healing of the chronic purulency of the drum-cavity ensues without synechial interference to the conduction of sound to the oval window, and the hearing is better in such cases than when healing occurs with the ossicles or their remnants in position. If, after six months or sooner, the tendency of the chronic purulency of the middle ear is not toward improvement under the above-named local antiseptics, it is because drainage is defective; antiseptics cannot reach the entrenched staphylococci, and caries and necrosis of the ossicles and, sometimes, of the neighboring tympanic walls, are advancing. This is especially true in chronic purulency of the attic. Such a patient is threatened now with deeper and most serious lesions in the antrum and mastoid cavities, involving the petrous bone on its

inner surfaces, in the middle and posterior cranial fossæ. For a consideration of these profound and threatening lesions the reader is referred elsewhere. (See CEREBRAL ABSCESS, volume ii, and ENCEPHALITIS, volume iii.)

Literature of '96-'97-'98.

In 14,580 autopsies 48 cases were found in which death resulted from cerebral disease secondary to purulent otitis media. Of 17 abscesses, 12 were in the temporal lobe, 4 in the cerebellum, and 1 in both cerebellum and occipital lobe. In 16 cases there was thrombosis of the sinus. Brain-abscess is found almost exclusively in chronic purulent otitis. Poulsen (Münch. med. Woch., No. 24, '96).

Septic infection may pass from the tympanic cavity and mastoid antrum through the labyrinthine spaces and auditory and facial nerves to the cerebellar cavity. Thomas Barr (Arch. of Otol., July, '97).

Chronic purulent otitis media having defied local antiseptic treatment for months, and the ossicles or the petrous bone in their vicinity being carious, the only indication is to remove the ossicles and thus favor drainage from the drum-cavity and better local treatment of its purulent walls by means of antiseptics. Some advise immediate resort to a mastoid trepanation and deeper surgical measures applied to the petrous bone, for the cure of chronic purulency that has defied for a year antiseptic treatment, without resort to ossiculectomy and further antiseptic treatment. But, in the absence of urgent and threatening mastoid and intracranial symptoms, mastoid trepanation is unjustifiable simply for the cure of chronic purulency. Indeed, in the absence of urgent cranial symptoms, removal of polypi, ossiculectomy, and excision of the remnants of the membrana followed by the application

of antiseptics will usually effect a cure of the tympanic purulency, in time, but in any case the condition of the inflamed middle ear is rendered better, thus preventing symptoms demanding a mastoid trepanation in any of its forms.

Literature of '96-'97-'98.

In 8 cases of the radical, or Stacke, operation on chronically suppurating middle-ear cavities good results were obtained notwithstanding the closing of the retro-auricular opening. Urbantschitsch (Aust. Otol. Soc., June, '96; Jour. Laryn., Rhin., and Otol., Oct., '96).

Reduction of otorrhœa, existing from birth, in a woman of 30, after surgical exposure of the middle-ear cavities and the removal of granulations, pus, and sequestra, one of which was the modiolus and the lamina spiralis ossea of the cochlea. A. Politzer (Aust. Otol. Soc.; Ann. des Mal. de l'Or., Feb., '97).

In 53 cases of chronic suppuration of the middle ear, middle-ear cavities exposed by surgical operation. In 17 instances the suppuration stopped at once; 6 patients died,—3 from pyæmia existing before the operation, 2 from chronic tuberculosis, and 1 from cerebral abscess existing before the operation on the ear. The remainder of the 53 cases continued under observation. A. Politzer (Aust. Otol. Soc., June, '96; Ann. des Mal. de l'Or., Jan., '97).

Of 61 cases operated upon for the relief of otorrhœa, 35 were cured, 17 improved, 1 was still under treatment, and in 8 the result was unknown. In cases where there had been extensive caries, 10 were operated upon by the Schwartze-Stacke method. Of these 6 were cured and 4 improved.

Twenty-six cases of chronic purulent otitis media were operated upon for the purpose of improving the function of the ear. In 22 cases the ossicles were removed. The hearing was improved in 17 cases and unimproved in 5. In 4 cases the operative procedure consisted in the division of adhesions, and the hearing was improved in every case.

In 20 cases the condition was one of otitis media purulenta residua, the sup-

purative process having run its course. The local condition was one of rigidity of the ossicular chain, due to the development of adhesions. In 18 of these cases synechiotomy was performed. The operation was followed by improvement in 17 cases; in 1 case the hearing was unimproved. In 2 of these cases the ossicles were removed, resulting in improvement in 1 case, while in the other instance the result was negative.

The total number of cases of non-suppurative middle-ear inflammation operated upon was 59, of which 52 were improved and 7 unimproved. E. B. Dench (Laryngoscope, Mar., '97).

Aural Polypi.—Aural polypi, often multiple, may form quickly, even in acute otitis media, but, as a rule, they are the result of chronic purulent otitis media.

Symptoms.—Their size varies from that of a small shot to that of a large pea. After attaining the latter size if allowed to grow they become compressed by the canal-walls and elongated, and finally protrude at the external meatus. The outer surface near the meatus in old polypi becomes pale and dermoid. Polypi are usually attached to the mucous lining of the drum-cavity. If attached to the mucous membrane of the osseous walls of the drum-cavity the growth obtains more nutrition and grows larger than one attached to the mucous inner surface of the membrana. Aural polypi are usually very vascular, but they contain no nerve-structures.

They are of inflammatory origin and constitute true tumors of a benignant nature. Their presence in the ear prevents a cessation of the purulent discharge. Sometimes an aural polypus undergoes a spontaneous detachment.

Treatment.—In the majority of cases aural polypi can be twirled off by means of a probe, under perfect illumination of the auditory canal. Or they may be

removed from their pedicles by means of a hook, shown in Fig. 6.

Usually it will be necessary to remove them by means of a snare or polypus-forceps. The best form of polypus-snare is that shown in Fig. 7. It is a Toynbee snare, modified by C. J. Blake, and then further modified by C. H. Burnett. Fine piano-wire (brass) should be used for the snare. Under perfect illumination of the ear by means of the forehead-mirror

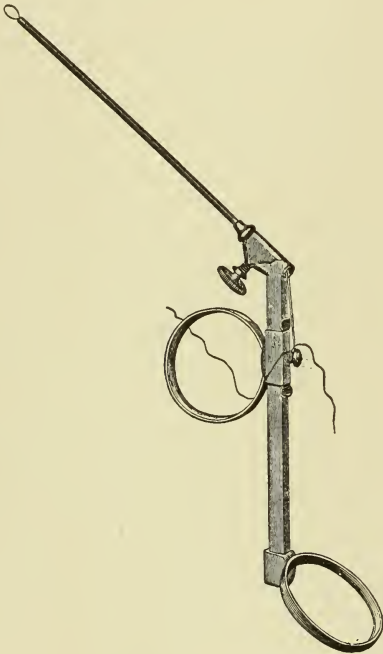


Fig. 6.—Polypus snare. (C. H. Burnett.)

or an electric head-lamp (Fig. 3), the instrument can be inserted by an expert hand into the ear, the polypus encircled by the loop of the snare and removed with ease. If the walls of the auditory canal and the fundus of the ear are not touched, there will be no pain inflicted upon the patient, as the polypus has no sensation. A better way still to remove a small polypus from the ear is to seize it with a polypus-forceps made

like the foreign-body forceps of Sexton (Fig. 5). In the author's polypus-forceps the blades are perfectly straight, and without the teeth of Sexton's foreign-body forceps. After a polypus is removed from the ear its attachment should be touched with a little absolute alcohol, or a minute quantity of chromic acid. Only as much of the latter as will moisten the end of a probe a millimetre in diameter should be used.

Literature of '96-'97-'98.

Case of chronic suppurative otitis of thirty-six years' duration. There was a fœtid discharge, hæmorrhage and pain in both ears, found to be due to multiple polypi and cholesteatomata. The polypi were removed, but recurred rapidly; alcohol and glycerin drops were used and all syringing prohibited. The cholesteatomatous masses were also removed gradually with forceps, and these and the polypi finally ceased to reform under the alcohol treatment. The patient has now been free from discharge for a year. The case is an illustration of the value of alcohol and glycerin in the treatment of both cholesteatomata and polypi. Treilian (*Jour. of Laryn., etc.*, Dec., '97).

Ossiculectomy.—In performing ossiculectomy in chronic purulent otitis media the patient should be etherized, in order to prevent his suffering and to keep him perfectly still,—movement of the head defeats the operation. Ossiculectomy has been performed under local applications of cocaine, but the anæsthesia is not total and the patient flinches or moves more or less. Again, as a good deal of cocaine solution is required, there is some risk of toxic effects.

The patient being under ether, the ear must be illuminated by an electric lamp held on the surgeon's head (see Fig. 3).

The remnants of the membrana over the region of the incus-stapes joint

should first be cut away (if not already eroded by disease and the malleus in part or in whole is still present) and the incus looked for. Sometimes the entire incus will be found in position, with its long process in connection with the stapes-head, and its body still in articulation with the head of the malleus. But this is the exception in chronic purulent otitis media. Most frequently the incus is entirely destroyed by caries. Sometimes the body of the incus, without its long limb, is found fused with the malleus head, and is removed with the latter, when the malleus is seized with forceps and removed from the drum-cavity after severance of its suspensory ligaments, synechiæ, etc. In other instances the body of the incus is partly destroyed by necrosis, its posterior part being intact and the long limb still attached to the stapes. If the incus is present with the malleus, the former should be removed before the malleus is disturbed. If the malleus is removed first, the incus, unless adherent to it, may fall into the lower, posterior part of the drum-cavity and be lost, or recovered only after considerable, and probably irritative, grappling. The incus being found and removed, the malleus may then be excised. Sometimes the remnant of the incus is not found until after the malleus is removed. Then with an incus-hook passed into the attic the incus is thrown forward and downward into the atrium and removed. The stapes *in no case* of chronic purulent otitis media should be removed, nor even mobilized, for fear of opening the oval window and inviting the entrance of pus into the internal ear and thence into the cranial cavity.

Extraction of the hammer and incus is only practiced if the greater portion of the drum-head is destroyed, and the hammer, therefore, is of no value for the func-

tion of hearing; also, when there is cholesteatoma in the attic. In perforation of Schrapnell's membrane, on the other hand, when suppuration is limited to the attic and the hearing-power is nearly normal, the hearing becomes diminished by extraction of the ossicles, and, in such cases, operative interference ought to be limited to opening the outer attic. Only after this treatment has proved ineffectual should extraction of

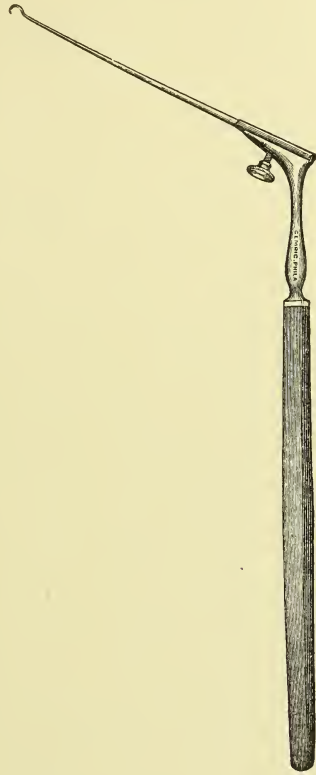


Fig. 7.—Polypus-hook. (C. H. Burnett.)

the ossicles be practiced. In cases where extreme deafness existed there was observed an improvement in hearing after extraction of the ossicles, but, when hearing was very near normal, the operation diminished it very much. Politzer (Eleventh Inter. Congress, '94).

Some of the most satisfactory results of excision operations have occurred in cases suffering from chronic otorrhœa. Most frequently the walls of the attic are also carious. Where such is the case,

it is of advantage to open this area freely. Having removed the malleus and incus, if no more necrosis exists, the operation is ended; but, if indications show the possible existence of more caries, the antrum is to be opened, the lateral masses of bone between the tympanum and antrum removed, as well as the entire posterior wall of the bony auditory canal. These spaces are thus all laid open into one space. The semicircular canals and facial nerve will not be injured if the lateral walls, only, of the antrum are chiseled away. Stacke (*Inter. klin. Rund.*, Dec. 21, '90).

The initial incision in the membrana may be made with a sharp-pointed knife (Fig. 4, *B*), but further cutting should be made with a blunt-pointed one (Fig. 4, *A*). The incus is best detached from the stapes by means of the incus hook-knife (Fig. 4, *D*), and if adherent to the attic should be turned forward, into the front and lower part of the drum-cavity, by means of an incus hook-knife with a longer and blunter blade than that for detachment of the incus from the stapes. When the incus is entirely freed from its attachments it may be drawn from the drum-cavity by the blunt incus hook-knife, or by means of the foreign-body forceps of Sexton's pattern.

In no case should the drum-cavity be curetted, as such a procedure is very likely to wound the facial nerve and induce facial palsy. It is, furthermore, unnecessary, as granulations will disappear and denuded bone-surfaces be covered in with new membrane, under proper antisepsis.

After removal of the diseased remnants of the membrana and ossicles the ear should be mopped with an antiseptic like alcohol or a solution of bichloride (1 to 5000) or formalin (1 to 1000), the meatus stopped with a light tampon of sterilized gauze, and the ear let alone for

twenty-four hours. If the gauze in the ear becomes moist with blood or bloody serum, it should be removed and a dry dressing put in the meatus—not far in the canal. In all cases the discharge diminishes at once, and ceases entirely in the majority of cases within a period ranging from a month to eighteen months. The after-treatment should consist in mopping the discharge from the ear and the instillation of a formalin solution (1 to 1000) from once a day to once a week, according to quantity and frequency of the discharge.

The hearing improves to varying extents, the general health of the patient is rendered better, and he is freed from the danger of extension of the suppuration to the mastoid and cranial cavities.

Chronic Mastoiditis.—Chronic mastoiditis the result of chronic suppuration may, like the latter, continue a long time without caries and necrosis of either the medial or the lateral plate of the mastoid cavity. In many instances the latter cavity becomes the seat of a cholesteatoma as the result of the long-continued suppuration in the middle ear and mastoid antrum.

It may be safely assumed that in every case of chronic suppuration in the drum-cavity there is a concomitant suppuration in the mastoid antrum, and sometimes, also, in the mastoid cells. If the chronic tympanic suppuration can be controlled or cured the lesions in the mastoid antrum are also cured at the same time. As has been said, ossiculectomy is the best way of curing chronic suppurative otitis and warding off or curing mastoid disease. However, many cases of chronic suppuration are either not treated at all or improperly treated, and the mastoid cavity becomes more inflamed; *i.e.*, its mucous membrane more infiltrated and its drainage defective.

Symptoms.—The disease may now take one of two courses, rarely both: Pain in the mastoid, with headache and fever, without any external mastoid symptoms, may indicate an irruption of pus either into the lateral sinus and posterior cranial fossa or forward into the middle cranial fossa. Or pain in the mastoid and fever may be followed by tenderness and swelling of the outer mastoid surface and spontaneous opening of the cortex, with escape of pus beneath the dense tissues of the cutaneous mastoid region.

Treatment.—An incision should be made and the pus evacuated. The osseous surface should then be fully exposed and the opening in the bone discovered. This should be followed, the bone well chiseled away, and the mastoid cavity thoroughly explored, all diseased tissue, both soft and hard, being removed. If the inner wall is intact, the cavity may be allowed to fill with blood (Blake), the wound drained and stitched, and healing by first intention sought. If, at the same time, all diseased tissues in the middle ear can be removed, entire recovery from the chronic purulency may be expected. If, after exposure of the mastoid and middle-ear cavities, a sinus is found leading to the cranial cavity, the mastoid operation represents but the preliminary to an operation upon the cranial cavity. No operation upon the encephalon for an otitic lesion can be considered complete until the mastoid and middle ear have been opened and the pathway of disease from the ear to the brain sought and followed; and the septic *nidus* in the drum-cavity and the mastoid permanently removed.

The operative procedure in opening the mastoid and antrum cavities in chronic intramastoiditis, by means of hammer and chisel, resembles that described for trepanation of the mastoid

in acute mastoiditis. It must be borne in mind, however, that in a case of acute intramastoiditis in an ear previously free from purulency, we shall find a much thinner cortex than would be found in a mastoid the seat of chronic purulency. In the first instance it is preferable to choose the point of trepanation at the suprameatal triangle and aim at once for the antrum. We make no effort to expose the attic and middle ear and disturb the ossicles, lest we destroy the hearing though we arrest the purulency. In chronic purulent intramastoiditis, always a result of chronic purulency of the drum-cavity, the surgeon in chiseling open such a mastoid should follow any spontaneous opening in the cortex already present, or open at a discolored or softened spot in the cortex, and then aim for the antrum and middle ear, thoroughly explore the middle-ear cavities, and remove all diseased tissues, including the malleus and incus or their remnants, but never the stapes in any case. This bonelet is very resistant to suppuration, and hence prevents the entrance of pus from the middle ear to the internal ear and thence to the cranial cavity. To remove it in chronic suppuration of the middle ear would be to invite the entrance of pus to the internal ear and consequent grave disaster. Every mastoid cavity, and hence every case of intramastoiditis, varies from all others. The surgeon must, therefore, prepare to go slowly, picking his way until he has exposed enough of the outer wall of the mastoid to see his way to the antrum or to the mastoid cavity before reaching the antrum, as is often the case in chronic intramastoiditis. It should go without saying that no one should attempt a radical operation on the mastoid unless he has had ample practice on the cadaver. And he should also be able to

penetrate the cranial cavity, by following a septic pathway from the middle ear and mastoid cavities if one exist and relieve the *nidus* in the brain-cavity.

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Philadelphia.

MIGRAINE. See NEURALGIA AND MIGRAINE.

MILIARIA (PRICKLY HEAT).

Definition.—A vesicular eruption of the skin due to profuse sweating.

Symptoms.—The eruption of miliaria consists of minute vesicles developed near the pores of the skin. These may be acuminated and red (*lichen tropicus*) and discrete and irregularly dispersed over the surface; or they may be confluent and red at the base (*red miliaria*). At first they contain a pellucid fluid, which occasionally tends to become turbid, then purulent. The eruption is apt to present in parts of the body covered by clothing. The vesicles usually dry up into minute scales. Sometimes the case is attended by lesions simulating those of eczema.

The active symptoms generally consist of a prickling sensation as if thousands of needles were being forced into the skin. This is followed by pruritus, and the case then proceeds to recovery if the irritating factor (heat) is avoided.

Etiology and Pathology.—The immediate causes of miliaria are heat and profuse perspiration. In an examination of specimens removed from patients of different ages, and from different portions of the body, Politzer found that the same conditions were present in all of the sections—an œdematous rete Malpighii, containing dilated sweat-ducts, with no change in the cutis except in the papillary layer, the horny layer of the epidermis being swelled by imbibition.

Treatment.—The treatment is mainly prophylactic: measures calculated to re-

duce undue exposure of the body to heat. When unavoidable climatic conditions act as cause, frequently repeated bran-baths (a pound of bran packed in a towel being allowed to soak) are sometimes very soothing. A solution of ammonia, a tablespoonful to a quart of water, generally allays the itching very promptly. Sponging with lime-water is preferable in children.

In the graver form Holstein states that thorough cleanliness must be insisted upon; the clothing should be boiled, and sublimate washes or ointments employed. In some cases the crusts of the lesions may be removed and peroxide of hydrogen applied. This should be repeated daily for several days, antiseptic ointments being applied between-times. The peroxide of hydrogen may be injected into the boils. Carbolic acid, aristol, eucrophen, resorcin, etc., and lotions of ichthyol (2 to 5 per cent.) made with a saturated solution of boric acid are recommended by various authors.

MILIARY, OR SWEATING, FEVER.

Definition.—Miliary fever is an infectious disease attended by profuse sweating and vesicular eruption of the skin.

Symptoms.—The attacks begin with gastric distress and general discomfort, which may precede the main symptoms by several days; but, in the majority of cases, a person apparently perfectly well will, during the day, complain of great fatigue and feebleness, and in the middle of the night be awakened by a profuse perspiration. The principal symptoms of the first period are, according to Thoinot, perspiration, fever, general debility, and nervous phenomena of diverse nature. Among the latter may be mentioned dyspnœa, usually paroxysmal, and without any pulmonary lesion appreciable upon auscultation; a feeling of

constriction in the epigastric region; great restlessness and delirium. Among the more infrequent are muscular cramps, especially in the muscles of the calf and the hand. The tongue is sabural, and constipation is usual.

Two phenomena are especially marked during the second period, namely: cough and epistaxis. The latter may be quite profuse, and occur daily or several times a day. The eruption is generally manifested about the fourth day; very rarely it may appear on the second or third, or it may delay until the fifth or sixth. It is preceded by itching and persistent tingling, and, as a rule, all nervous phenomena are redoubled for the moment, to be mitigated when the exanthem appears. The eruption consists of two forms: 1. The miliary eruption, properly so called,—that is to say, a miliary papule which appears as a little acuminated point upon the cutaneous surface, and is slowly transformed to a vesicle, which discharges and finally exfoliates. 2. The exanthem, which is the substratum, the base of the miliary eruption. This may be classified into three forms: the rubeolar, which is composed of crescentic patches, more or less confluent; the scarlatiniform, where the cutaneous surface is of uniform coloration; and the amorphic or purpuric form, the cutaneous surface being tinged a dark red, which does not disappear upon pressure, and in which purplish patches are to be observed.

MILIARIS ALBA.—Under this name may be described a special variety of the eruption, consisting of diaphanous vesicles upon a normally-colored skin. The sweating becomes less marked as the eruption progresses, the skin remaining moderately moist; fever is less active; general debility and cephalalgia diminished. Nervous phenomena become

quieted. The pulse-rate greatly diminishes, falling often to 55 in a minute; cough becomes more frequent, auscultation revealing bronchial râles; constipation persists. The stools are of the consistence and appearance of tar, and quite foetid. The urine, which at first was diminished, and in some cases totally suppressed for several hours, resumes its normal characteristics. Albuminuria is not to be found. Epistaxis continues in some cases, other hæmorrhages being added. Hæmoptysis occurred infrequently.

The third period is that of desquamation, which process may take place discretely at separated points, or in large patches. The disease has virtually come to an end when the eruption appears, and usually about the eighth or the tenth day convalescence begins. This is uncertain and tardy.

The convalescents present pronounced anæmia; very often there is œdema of the lower limbs; the muscles of the face exhibit fibrillary tremors; the tongue trembles after the fashion of the tongue of paralytics; insomnia, persistent anorexia, and a tendency to profuse perspiration upon the slightest exertion, are noticed. Among the rarer phenomena are rectal crises analogous to those of locomotor ataxia, crises of costal neuralgia, and irregularity of the heart. These phenomena disappear gradually, but it may be two months or more before the last trace of the disease has been effaced.

Among the anomalous forms of the disease is that without eruption and that without sweating.

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Epidemic of miliaria which affected children almost exclusively. In one town 38 children of 100 were affected, and in 21 instances more than one member of a family was attacked. There were two or three days of malaise, loss of appetite, and tendency to vomiting. On the third

day an eruption appeared as a diffuse redness, most marked in the face; the red parts being covered profusely with white sudamina. There was slight difficulty in swallowing. The red eruption was not always present, but the miliaria were constant. The throat and the soft palate were usually brilliantly red. Stoodesandt and Hocke (Berliner klin. Woch., Aug., '98).

Etiology.—Miliary fever is not transmissible by contact, but by infection, according to Thoinot. It is, in all probability, of microbic origin. The period of incubation may be very short,—less than twenty-four hours. The maximum period cannot be fixed. Neither age nor sex appears to have any influence upon susceptibility, but the disease manifests a curious predilection for children and robust men, as also for alcoholics. It is endemo-epidemic in France, England, Germany, and Italy. It recurs in the same patient. It may pass from the mother to the foetus.

Most epidemics occur in the spring and summer.

Report of epidemic that occurred in Austria in 1893 and which continued almost three months. Out of the entire population of the district, 5079 persons, 159 suffered: 128 children, 17 men, and 14 women. Schaffer (Wien. med. Blätter, No. 32, '93).

Treatment.—The treatment is purely symptomatic, the aim being to alleviate the irritation of the skin. Bran lukewarm baths or sponging with lime-water tend greatly to allay the itching and encourage the resolution.

Internally, quinine has been found efficacious. Calomel in small doses, when administered early, is thought to shorten the disorder. The measures adopted for the treatment of scarlatinous rash is also applicable here.

MILIARY TUBERCULOSIS. See TUBERCULOSIS.

MILK-SICKNESS.

Definition.—A disease, usually met with west of the Allegheny Mountains and in North Carolina, thought to be communicated to man by milk, butter, cheese, and meat obtained from lower animals suffering from the "trembles."

Symptoms.—The early symptoms resemble somewhat those of typhoid fever: lassitude, languor, anorexia, dull headache, and thirst. After a few days the fever becomes marked, there is gastralgia, nausea and vomiting, a heavy breath, and, as a rule, constipation. The tongue appears enlarged, and when drawn out is tremulous. The foetidity of the breath becomes so great as to constitute a characteristic feature; it suggests, according to Graff, that observed in variola. Nervous manifestations soon become noticeable, restlessness and convulsions alternating with periods of apathy and somnolence, gradually merging into a low typhoid state, during which the patient may succumb.

The mortality of this disease was quite large when the Western States were first settled, but the prevalence of the disease and its death-ratio have gradually decreased. The clearing of forests and the drainage of marshes are thought to have done much to bring about this result.

Under proper management the prognosis is usually favorable. The active stage of the disease is very variable, however, and death may occur as early as forty hours after the onset. On the other hand, the disease may last a month.

Etiology and Pathology.—As stated, the disease is thought to occur in man as the result of infection from food derived from animals suffering from the "trembles." Beef, veal, and mutton represent the most dangerous meat in this connection, cattle and sheep being susceptible; milk, butter, and cheese ob-

tained from cows and goats, especially the first named, however, are thought to constitute the main sources of infection. The toxic character of these contaminated foods have been proved by experiments, dogs fed on them having died within a few days. The pathological lesions have not been established. The disease, as it occurs in animals, is thought to be of telluric origin.

Treatment.—Prophylaxis is of primary importance. Unfortunately, the disease may be latent in an infected animal before active symptoms appear. In the cow, for instance, the “trembles” may only become apparent when the animal is rapidly driven, though her secretions may, according to Graff, be infective. When the active symptoms appear in an animal, staggering and trembling are the first symptoms to draw the attention of the herder; anorexia and congestion of the conjunctiva are then noticed, and rapidly followed by spasmodic jerks, convulsions, and death. The existence of the “trembles” in neighboring districts should awaken the watchfulness of the local physicians and these should institute active measures to prevent infection of the inhabitants.

As soon as a case is recognized, a saline purgative should be administered and the elimination of the toxic elements encouraged by the copious use of pure water and diaphoresis. The supporting measures now indicated are mainly useful in sustaining the patient through the period during which the system is gradually freeing itself of the poison ingested.

MISCARRIAGE. See ABORTION.

MITRAL VALVES. See VALVES.

MORPHINE, OR MORPHIA. See OPIUM.

MORPHINOMANIA AND OPIUM HABIT.

Definition.—Morphinomania and the opium habit may be defined as an irresistible craze for morphine, opium, or any of the preparations of the latter drug. The term “morphinism” is applied to the symptom-complex resulting from the undue use of morphine.

Symptoms.—Though the effects of the drug may be somewhat modified by the idiosyncrasy of the individual opium *habitué*, there is a certain train of symptoms which usually follows the consumption of a dose sufficient to procure the characteristic action. A few minutes after the dose, with a shorter interval when given hypodermically, the face is suffused with a blush, with probably a well-defined hectic spot. The eyes sparkle with unwonted brilliancy. The countenance is ruddy and the expression animated. This is the stage of excitement or exhilaration. The pulse beats faster and muscular activity is increased.

This exhilaration gradually subsides into a sense of complete happiness, satisfaction, and repose, with a slower pulse-rate and muscular quietude. This constitutes the second stage.

A vacant look, with an occasional gleam of momentary consciousness, ushers in the third stage. The opiiized gradually sinks into a state of torpor, from which he is with difficulty aroused. The only effectual means of arousing him is to administer a fresh dose of the narcotizing agent. The face looks pale or dusky, the skin is withered, the pupils are contracted to the size of a pin's head.

The vascular system is relaxed in the first stage and slightly tightened up in the second, this contraction being intensified in the third. The awakening from the third stage of torpor-prostration, and apparently impending death, is

wretched. Tremors are succeeded by growing restlessness, and with returning consciousness there is an overwhelming sense of intolerable uneasiness, distress, and depression, which imperiously craves for a renewal of the bewitching soporific. In this state of reaction the agony, or desperation, is sometimes so acute that suicide or homicide has been the issue.

Case of a morphinomania, who was affected with somnambulistic spells, when he would get up during the darkness of night, resume his official work in his office, and indite papers full of figures, all found accurate when he awoke to consciousness. Brazier (Alienist and Neurologist, July, '92).

The quantity taken is sometimes enormous. In one case of female addiction I have known as much as one pint of laudanum drunk daily; and in a male case 150 grains of solid opium eaten in the same period, and 31 grains taken at one dose. One male patient injected 20 grains of morphine per diem in divided doses under the skin. Another took 60 grains on an average each day. But the ordinary amount of the narcotic usually taken by opium inebriates is very much less than any of these extraordinarily excessive quantities. In my observation the average daily allowance of laudanum has been rather over 1 ounce, of opium about 30 grains, and of the hypodermic self-administration of morphine salts about 8 grains. These quantities, as well as the more excessive, have sometimes been taken daily for periods of months and years.

Case of physician's wife who, after 40 grains hypodermically and one or two 5-grain doses daily by mouth, advanced to from 60 to 75 grains daily of morphine by the mouth only, and at one dose. Afterward she resumed the hypodermic injection of 40 to 50 grains. One laudanum-taker of twenty-two years' standing reached nearly a pint per day.

J. B. Mattison (Times and Register, Oct. 18, '92).

Case of double addiction (morphine and cocaine) whose daily ration was 60 grains of morphine sulphate and 70 grains cocaine hydrochlorate hypodermically; and one of laudanum, 17 fluid-ounces being taken daily. S. Lett (Times and Register, Oct. 18, '92).

My experience is that among male adults the increase is chiefly in opium-smoking and morphine injection, and, among females, mainly in laudanum.

Opium smoked is more quickly absorbed than opium eaten, but it is less harmful, as only a comparatively limited quantity can be inhaled at a time. With the latter mode of use there is greater disorder of digestion. Opium drunk in a liquid form may be classed alongside opium taken as a solid. The speedier absorption of laudanum is more than counterbalanced by the smaller quantity that can be taken on account of the larger bulk. The hypodermic injection of morphine is, however, the most swift and the most potent of all the methods of administration. The effect is almost immediate. The simplicity, ease, and celerity with which the narcotic effect can be secured have combined to make this subcutaneous process of self-administration peculiarly popular and seductive.

No one can describe the torture experienced by opium inebriates on the failure of the supply of a fresh dose at the accustomed time. While in this fatuous, listless, irritable condition, the patient will at once become lively, clear-headed, and brilliant on the exhibition of a sufficient dose. This depraved physical state is a pathological condition: a physical depression which clamors for a renewal of the potion as soon as the pleasurable effects of the preceding dose have disappeared.

Alcohol infuriates many of its users. Opium, on the contrary, while its effects are somewhat varied, comparatively rarely hurries its devotees into a thousand extravagances, eccentricities, and misdeeds. In alcoholic public-houses are frequently to be heard heated arguments and disturbances. In opium-dens there is usually an atmosphere of quiet and repose. Withal, however, opium in some cases begets foolish and fatuous acts. On the inhabitants of the Malay peninsula, as on a few other peoples, opium seems to have sometimes an excitable effect. A large dose will affect some Malays so that they will "run amok," attacking everyone in their way.

The alcohol-inebriate is often notoriously untruthful, the opium inebriate only comparatively so. He usually pleads guilty if accused of the habit, and readily tells you about it, although some opiists, like many alcoholics, will deny that they ever touch the drug, though at that very moment they are consuming it.

The testimony on oath of the habitual morphine-taker is worthy of discredit in legal matters. Henry Freeman Walker (Med. Rec., Nov. 16, '95).

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Patients suffering from morphinism are liars. They become slovenly, dirty, and untidy. Physically, they are thin, sal-low, and anæmic; they look prematurely old, their hair falls out, their teeth decay, their nails become brittle, and they suffer from dyspepsia and great constipation. The mouth is dry and the pupils are contracted. Hale White (Guy's Hosp. Gaz., Mar. 19, '98).

The opium-drunkard is, on the whole, more of a slave than the alcohol-drunkard. It is more difficult to keep within limited indulgence with opium, so that "moderate" or "restricted" opium consumption is very much more difficult of accomplishment than "moderate" or "re-

stricted" drinking of alcohol intoxicants. It must not, however, be supposed that a continued moderate or restricted consumption of opium is impossible. In opium-using countries the majority are able to limit the quantity which they consume.

Many male opium-inebriates are impotent, the capacity returning on discontinuance of the narcotic habit. To a less extent an allied phenomenon is exhibited in females, failure of conception frequently taking place after the habit has been fairly launched. Amenorrhœa and irregular menstruation are common.

Menstruation seriously interfered with or entirely suppressed in nearly all cases of the morphine habit. Sherman (Med. World, Nov. 8, '88).

Cessation of menstruation in cases of insanity treated by morphine injections for a continuous period, with return of menstruation upon cessation of the morphine. Roller (Berliner klin. Woch., Nov. 26, '88).

Morphine does not abolish the sexual appetite in women. Offspring are generally born with congenital heart disease. Hoppel (Med. and Surg. Reporter, Sept. 10, '92).

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Morphine produces impotence in the male and amenorrhœa in the female. Editorial (Med. Rec.; Bull. of Pharm., June, '97).

The effect of long-continued opiism is seen rather in nervous disquietude and excitability, leading to speculation and gambling. There is frequently associated immorality, the latter vice being encouraged for purposes of gain by many keepers of these dens. There is an erotic influence in many cases during the earlier stages. Murder has been committed in the ungovernable fury of disappointed narcotic lewdness.

Simple morphinism rarely causes a state of mental alienation sufficient to

allow a plea of irresponsibility. It never produces irresistible impulse, but in the more profound disturbance, known as morphinomania, irresistible impulse and other pronounced mental disturbances may occur. Regnier (*Essai Crit. sur l'Intox. Chron. par la Morphine et sur ses Diverses Formes*, '90).

A common feature of all narcotic inebriety is the frequent perversion of the affections. Love is transformed into hate, and the narcomania not unseldom loathes the sight of the devoted companion whom, in his prenarcotic years, he cherished with the tenderest affection. Opium transforms the manly, high-toned, pleasant companion into an effeminate, driveling, querulous bore.

In some localities, especially in China, the opium degradation is so terrible that gross immorality abounds. So intense is the crave that a man has been known to mortgage his mother and sell his wife to gratify it. One man sold his wife for £12, and smoked the proceeds. This crave robs a man of his resources, unfits him for work, and hurries him to an untimely end.

To opium is due a large percentage of mortality among children: crime, murder, and disease. More than three-fourths of between 800 and 900 prisoners in Jeypore Central Prison used opium, quite one-half of them to excess. Valentine (*Indian Med. Gaz.*, June, '91).

One hundred thousand persons commit suicide by opium every year in China. J. L. Maxwell (*Lancet*, Jan. 28, '93).

In Hardoi, of 180 suicides in three years, 97 were from opium, 80 per cent. of these being women. McReddie (*Lancet*, Jan. 28, '93).

Literature of '96-'97-'98.

Morphine produces abulic states, which predispose to imperative conceptions, leading to theft, usually of a senseless type. J. G. Kiernan (*Jour. of the Amer. Med. Assoc.*, Dec. 11, '97).

Diagnosis and Complications. — Al-

though it has often been asserted that the opium-slave is easily recognized by his glazed eye, hollow cheeks, wasted frame; dry, parchment-like skin; slothful habit, and livid countenance, the opiomaniac and morphinomaniac are often difficult of detection, if they have a supply of the drug about them.

[In one case, a brilliant young medical student had habitually taken opium for two years without the habit's having been suspected by the chum who shared his rooms. The truth was disclosed unexpectedly, owing to an unusually large dose's having been taken by mistake. It is astonishing how dextrous with the hypodermic syringe the inebriate becomes. I have seen a body speckled all over, except on the head, face, and neck, with minute, dark, indurated spots, though usually the thighs are the favorite injecting field. NORMAN KERR.]

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The diagnosis of morphinism is easy. On examining the arms, scars caused by the use of the hypodermic syringe are readily seen. Hale White (*Guy's Hosp. Gaz.*, Mar. 19, '98).

In quite a number of cases of opiate inebriety I have noted that a spell of inebriate indulgence is invariably accompanied by severe persistent pain in the epigastric region, yielding after a few days of abstinence. So characteristic has this pain been that I have been enabled thereby to diagnose secret inebriety of both forms.

Symptoms resembling ague are occasionally seen, in both the presence and absence of the narcotic. There are high temperature and shivering, like the cold and hot stages of intermittent fever. There is also an opiate and morphine trembling delirium, exclusive of the acute wakeful and trembling delirious state supervening on sudden withdrawal.

Chronic dysentery is a frequent complication in confirmed opiomania. Dys-

peptic and neuralgic painful troubles are among the most common ailments, thus provocative of, or intercurrent with, opiomania. A harassing cough is an occasional complication.

Evanescient albuminuria at times occurs, during the exhibition of the drug and also after its discontinuance. It is apt to last for a few days at a time and to recur at intervals.

Permanent albuminuria may develop under prolonged abuse of morphine. Huchard (*La Sem. Méd.*, May 14, '90).

Two cases of opium-eaters, each taking more than 4 drachms of the drug daily, who suffered from albuminuria. Hingoli (*Indian Med. Record*, Apr., '92).

Cirrhotic and nephritic disorders are infrequently seen with opium. It is almost a tradition of the medical world that disease of the kidneys is apt to occur in the person of morphinomaniacs and opiomaniacs; but, though I have always been expecting to discover albuminuria in this group of narcomaniacs, I have never yet detected albumin in their urine, except when the kidneys were affected with organic kidney disease prior to the development of the narcotic symptoms.

Morphine can be detected in the urine.

The urine in morphinomania reduces sulphate of copper if heated with caustic soda, and gives, although slowly, an abundant precipitate of copper oxide, while polarization and fermentation give a negative result. With phenylhydrazin a precipitate of osazone, about 46 grains to the quart of urine, is obtained. This osazone is distinguished from glucosazone by its point of coagulation, 316.4° F., which is much lower than that of glucosazone, and by the fact that it is soluble in water. Salkowski and Jastrowitz (*Centralb. f. d. med. Wissen.*, No. 19, '92).

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To detect morphine about twenty ounces of urine are collected from the

suspected person. If it has not an acid reaction it should be acidulated with dilute hydrochloric acid and concentrated to about three ounces, when it is allowed to stand in a cool place for twelve hours; then filtered. To the filtrate is added sufficient sodium carbonate to render it alkaline. It is then allowed to stand twelve hours; filtered and the precipitate collected and washed with distilled water made slightly alkaline with sodium carbonate and dried. The dried precipitate is digested with pure alcohol at a gentle heat and filtered. This is evaporated to dryness, the residue is dissolved with dilute sulphuric acid, and tested for morphine by the iodic-acid test, or other well-known tests. By this method morphine can be obtained from persons taking but very minute amounts of the drug. Stephen Lett (*Lancet*, No. 8, '98).

The temperature is lowered by alcohol sometimes several degrees, and slightly raised by opium.

Etiology.—Opium-inebriety is much more common in the United States than in Great Britain. It is computed by Crothers that there are 100,000 opium inebriates in the great American republic. For one case in England, I have known thirty in the United States, and I have had the opportunity of observing in person the enormous consumption in some of the States of the American union. The medical profession seems to afford the greatest number of victims.

Seventy per cent. of personal cases were medical men. J. B. Mattison (*Jour. of the Amer. Med. Assoc.*, Aug. 4, '94).

Medical men and persons associated with them make up half the total of male *habitués*. J. Bochart (*La Sem. Méd.*, Sept. 8, '94).

Of 545 morphinomaniacs, 289 were doctors. Lacassagne (*Brit. Med. Jour.*, July 15, '93).

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Of male morphinists, the medical profession supplies the largest number: 40

per cent. Men of leisure come next, with 15 per cent.; then merchants, 8 per cent.; while peasants, clergymen, and politicians occupy the lowest positions on the list. Women of means are the most numerous class among the females, 43 per cent.; followed by wives of medical men, 10 per cent. Editorial (Med. Rec.; Bull. of Pharm., June, '97).

Statistics as to morphine *habitués* treated in Prussian sanitariums show that, of 62 male patients, almost one-third were physicians, and of 18 married female patients, 3 were wives of physicians. Editorial (Phila. Med. Jour., Oct. 8, '98).

A very short time suffices for the establishment of opium-inebriety. It is, not infrequently, silently, yet surely, set up in from four to six weeks. The period of incubation varies in duration with the idiosyncrasy of the subject and the means at his disposal of procuring supplies of the deceiving drug. The initiation of the practice of opium- or morphine-taking shows some different starting-points than those from which inebriates set out on an alcoholic career. The most frequent apology with which I have been favored by opium- and morphine-inebriates has been that they first had recourse to the drug to procure sleep. Insomnia, an increasing trouble in these days of mental overpressure and overstrain, is frequent among literary workers and members of the learned professions.

In the United States the intense nerve-activity and exhaustion of the people, and, within extensive tracts of country, the prevalence of malarial fevers of a low type, with their depressant sequelæ, are the principal introductions to opium-inebriety.

A sedative for the relief of pain has been the origin of the habit with nearly as many. Obscure and intense neuralgic pains being generally relieved as by a charm by morphine introduced subcu-

taneously, this also is a frequent inauguration of the habit. The enormous amount of opium given to children in the form of soothing syrups has much to answer for in the increase among us of opium indulgence.

[Twenty years ago a gentleman who was a martyr to unbearable attacks of sciatica of a purely neurotic origin, who had been thoughtfully treated and kept from this perilous practice by his medical attendant, went off to consult one of the greatest surgeons of that day. The patient in a day or two thereafter returned exulting to the family physician, exhibiting the hypodermic syringe which had been ordered by the consultant, and demonstrating the dexterity with which he could perform the operation. The unfortunate sufferer had not the slightest idea that this self-medication involved any danger. NORMAN KERR.]

Neuralgia is the most prolific cause of morphinism. J. B. Mattison (Med. Rec., Oct. 26, '95).

According to the statistics of institutions for the treatment of opium-addiction, there is no class of invalids from which there have been more opium *habitués* recruited than chronic neuralgics. Wendell Reber (Buffalo Med. Jour., Dec., '95).

Injudicious medical prescription has had much to answer for in introducing the practice of the autoinjection of narcotics.

Nearly all personal cases of narcotic inebriety are to be attributed to medical prescription of the drug in the first instance. J. B. Mattison (Med. Rev., Feb. 11, '93).

Case of chronic morphinism in which the drug was taken in solution by rectal injection in enormous doses, estimated about 5 pounds in ten years. Brazier (Jour. de Méd., July 19, '91).

Medical practitioners cautioned against administering opiates for the relief of pelvic pain. Hines (Maryland Med. Jour., Mar. 19, '92).

The need of strict enforcement of laws

governing the sale of opiates by druggists emphasized. Exposure of morphinomaniacs by registering in an open ledger the names of all purchasers of opium not presenting the prescription of a reputable physician, recommended. Happel (*Atlanta Med. and Surg. Jour.*, July, '95).

The opium habit cannot lay claim to great indebtedness to direct heredity, though its descent through three generations has been observed. It is, in a vast number of cases, an undoubted disease, a functional neurosis, whence arises a physical crave for a renewal of the sensation of intoxication. Thus considered, it is important to bear in mind that a considerable proportion of opiomaniacs are the subjects of neurotic inheritance. Alcoholism in parents may tend to opium excess in the children, or to some other interchangeable neurosis.

The opium habit appears most frequently in persons with a neurotic and opium diathesis, persons suffering from disturbances of nutrition, and those who are invalids or have the entailment of a previous disease or injury. Crothers (*Quarterly Jour. of Inebriety*, Apr., '92).

The offspring of the victim to the morphine habit has a condition of the nervous system such as, once subjected to some exciting cause, develops the tendency rapidly. Hoppel (*Quarterly Jour. of Inebriety*, Oct., '92).

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A few of the most important causes which lead to the habitual use of opiates are: First. Inheritance. It has been proved that women who become pregnant while using opium are very likely to miscarry, but that when they go to full term the majority of the children die unless given paregoric or some other form of opium, but an inherited tendency to narcotics or stimulants is more frequent. Second. Severe pain, long continued. Third. Overwork and loss of sleep. A. J. Pressey (*Cleveland Jour. of Med.*, Jan., '99).

Though some children of opium-inebriates inherit a debilitated constitution consequent on parental indulgence, the proportion who are so weighted is not large compared with the proportion of children afflicted with alcoholic heredity. Yet, in a substantial proportion of opium cases both the inebriate and neurotic inheritance has been traced, in some instances one and in other instances both forms of transmission being present. The narcomaniacal diathesis seems to occur in a dissimilar as well as in a similar form. In favoring circumstances under the influence of inebriate exciting causes, the progeny of opium-drunkards have exhibited a tendency to alcoholic excess, and the children of alcoholists to opiate intemperance.

Female alcoholic inebriates, especially in England, are very common. Female opium-inebriates are rare. In China and other Eastern countries a very much larger proportion of females are victims of opium-inebriety than in Great Britain or America. In many opium-dens in those Oriental regions women form no inconsiderable ratio of the smokers.

The Burmese appear most incapable of using opium in moderation, while in China the majority are able to limit their consumption, and never increase their daily allowance.

The legitimate Chinese imports of Maliva opium, the product of Central India, alone exceeds 2000 tons. The importation of Bengal opium amounts to about 1200 tons. Hart (*Brit. Med. Jour.*, Mar. 6, '89).

The greatest liability is between 30 and 50 years of age, the number of cases below and above that age being comparatively few.

Pathology.—The pathological changes which have been observed in opiumism are few and limited. The shrunken and withered appearance of the habitual

opium-inebriate is a fair representation of his internal physical state. The repeated contraction of the vessels impairs the nutritive process. When the opium habit has become a disease it alters nutrition and perverts vital function.

Morphine in the body, by taking up oxygen, is changed into oxidimorphine, which latter gives rise to symptoms of abstinence. Use of atropine for relief is irrational and should be abandoned. Erlennmeyer (*Amer. Jour. of the Med. Sciences*, Apr., '94).

A striking point of difference is that there are few animals which cannot be alcoholized, while opium is innocuous to many. Elephants, horses, dogs, monkeys, and jelly-fish have been brought under the influence of alcohol.

In carefully-conducted scientific experiments representatives of the brute creation have been slain prematurely by both acute and chronic alcohol poisoning. On the other hand, pigeons live and thrive on opium.

Principal conclusions of experiments on cats for purpose of producing morphinism are as follow: (1) morphine is always, and in all doses, an excitant and convulsant to the cat; (2) this is manifested by agitation, hyperexcitability, hallucinations, and a restless drunkenness; (3) contrary to what is observed in all species of animals in which this drug is an hypnotic, the pupils are dilated, the respiration and the heart are accelerated, the chilling of the peripheral parts indicates vasoconstriction, and there is an abundant hypersecretion of saliva; (4) the employment of large doses produces an exaggeration of the symptoms mentioned, and a modification in the gait of the animal is observed,—it frisks about, and convulsive shocks follow; (5) when a dose of $\frac{3}{8}$ grain per $2\frac{1}{2}$ pounds of the animal is given, it is usually fatal to the cat, which becomes more and more excited, has violent convulsions, and dies in a state of tetanic rigidity; (6) contrary to what is observed in animals which morphine calms,

the young subjects are less sensitive to it than the old ones, and in all the animals of this species in which morphine is constantly excitant it is an excellent adjuvant to anæsthetics. Guinard (*Lyon Méd.*, Aug. 16, '91).

Organic lesions are comparatively rare. Even when premature death ends the succession of alternating states of woe and bliss which constitute the opium-inebriate's life, functional derangement, impairment of the nutritive process, nerve-exhaustion, a dried, wrinkled, cadaverous skin, general wasting and emaciation, and a bent form are prominent links in the lethal chain.

Opium may be a contributory cause of paralysis, but it does not act directly as a paralyzer.

Prognosis.—Opium transcends alcohol in the generation of a more irreclaimable and incurable diseased condition. Cured opium-inebriates are comparatively fewer in number. It is much more difficult to abandon the opium than the alcohol habit. In China, in districts where almost the whole population indulge to excess in opium, the people are (humanly speaking) beyond the pale of moral and religious effort. The perception is so clouded that they are not amenable to intellectual and other elevating influences. Opium seems to take an even closer and more enduring hold on the human brain than does alcohol.

Thirty per cent. of proper cases, properly treated, resulted in permanent recovery. J. B. Mattison (*Jour. of the Amer. Med. Assoc.*, Dec. 28, '94).

In the young the prognosis of morphinism is good. Every case—unconnected with structural lesion or if nutrition be not too greatly damaged and if given proper care—can be cured. J. B. Mattison (*Archives of Ped.*, Nov., '95).

In women the prognosis of morphinism is better than in men. Recovery takes place sometimes in apparently hopeless

cases. J. B. Mattison (N. Y. Acad. of Med., Oct. 24, '95).

The morphinomaniac's only chance of recovery is to enter some hospital and put himself unreservedly into the hands of a doctor. Grelletty (Jour. of Mental Sci., July, '93).

Reports received from 937 cases, showing 421 treated at sanitariums, with 63, or 15 per cent., cured; 358, or 85 per cent.; failures; of the number of cures reported 33 proved relapses. Of 560 treated at home there are 268, or 32 per cent. of cures, and 48 per cent. of failures. Editorial (Med. Summary, Dec., '95).

Literature of '96-'97-'98.

The prognosis of morphinomania is favorable, although relapses are frequent. Editorial (Med. Rec.; Bull. of Pharm., June, '97).

Treatment.—In morphine-inebriety, in whatever form the narcotic has been taken, it is desirable to withdraw the poison as speedily as may be practicable. But the difficulty here lies in the practicability. The narcotic has been suddenly withheld, and it has been gradually tapered off. Among other distressing symptoms after sudden withdrawal, the following have been observed in an aggravated form: Rigors, nausea, vomiting, exhaustive diarrhœa, convulsions, delirium, prostration, and collapse. Languor and sneezing are minor troubles. The agony is in many cases indescribable, and the symptoms are so alarming that the full narcotic dose of the drug has had to be given to avert a fatal issue.

The violent diarrhœa and vomiting following sudden demorphinization are not usually harmful, being due to sudden renewal of hepatic action, and the consequent elimination of bile probably containing stored-up morphine. The flow should be allowed to continue, but under strict medical supervision, lest bulbar asphyxia ensue. Sollier (La Semaine Méd., Aug. 17, '95).

The prisoners at the Ahmedabad Jail addicted to opium, whose opium was stopped, lost weight only slightly in the beginning, and ultimately gained in weight. J. Benjamin (Der prakt. Aerzt, Aug. 1, '93).

Six cases of morphinomania treated by sudden withdrawal of the drug with success. Comby (Le Bull. Méd., June 24, '94).

Sudden method of withdrawal in healthy patients who are taking an amount of morphine exceeding 8 to 10 grains per day favored. Giles de la Tourette (Bull. de Thér., Sept. 15, '95).

Cases reported showing that sudden and complete withdrawal of the drug is not followed by deleterious results. M. V. Ball (Med. News, June 29, '95); M. E. Hughes (N. Y. Med. Jour., Mar. 2, '95); J. M. Taylor (N. Y. Med. Jour., Apr. 20, '95); Gaillard (Revue Inter. de Méd., etc., Feb. 10, '95); Hodée (Thèse de Paris, '95); Rendu (La Tribune Méd., Nov. 8, '94).

Literature of '96-'97-'98.

In hospital-practice opium or its preparations may be withdrawn at once absolutely, but in private practice this is impossible. Under the latter conditions the drug is withdrawn gradually and strychnine in large doses is given hypodermically, and equal parts of red cinchona and fluid extract of coca—1 drachm of this—are administered by the mouth. If the nervous paroxysms are marked, potassium bromide must be added. The patient should be kept in ignorance of the amount of the opiate taken and of its final discontinuance. Robertson (Med. News, Aug. 27, '98).

My sympathies are with the heroic course, but the sufferings undergone, with some risks (such as paralysis) consequent on the peremptory stoppage of supplies, have forced me to the conclusion that gradual diminution of the dose ought to be the rule. Especially is this procedure indicated when we are dealing with parturient *habitués* and with their offspring.

Newborn children of female morphine *habitué*s are apt to suffer from collapse, which may end in marasmus and death unless opium be given them. Erlenmeyer (Annual, '88).

Death of a newborn child, through lack of opium, the mother having been an opium-slave. Hayes (North Carolina Med. Jour., Feb., '92).

Three cases of abstinence symptoms in newborn children of opium-taking mothers, who were unable to nurse them. Kiernan (Review of Insanity and Nervous Disease, Mar., '91).

Literature of '96-'97-'98.

The fœtus *in utero* may survive despite the fact that large doses of morphine are taken into the mother's circulation. Morphinism may be transmitted directly from mother to child *in utero*, should the fetus survive gestation.

Delivery of a morphine *habitué* who had been taking daily 5 grains of morphine hypodermically, of a well-developed child, which gradually became irritable, and fretful, and finally refused food. One-twentieth of a grain of morphine was administered hypodermically with no other than a soothing effect. Under small doses the child has continued to grow rapidly. P. C. Layne (Cincinnati Lancet-Clinic, July 9, '98).

There are cases in which immediate cessation of the drug occasions comparatively little distress, and is successful, but these have been, so far as I have seen, exceptional. I generally spread the period of gradual diminution of the dose till entire discontinuance of the drug over four or five weeks. The length of this tapering-off process, however, depends chiefly on the daily amount of opium or morphine used, while taking the idiosyncrasy of the narcotee and the effect of the poison on the individual constitution into account. Occasionally three weeks suffice, but the duration sometimes extends over eight weeks.

From six to twelve days are occupied in the withdrawal, according to the

patient's age and condition, the size of the dose, the duration of the habit, etc. The accustomed dose is reduced one-half at the beginning and the remaining dose divided in half once or twice afterward. The evening dose is retained the longest.

Removal to a special asylum for the cure of the morphine habit is recommended as by far the best procedure. The most dangerous symptom of morphine abstinence is collapse. The best remedy for this is morphine. An hypodermic injection of $\frac{3}{10}$ grain should be given on the appearance of irregularity of the pulse and respiration, pallor, or the sensation of swooning. If amelioration does not promptly follow, the dose should be repeated, if necessary, two or three times. For vomiting, brief abstinence or reduction of food, the use of ice and champagne, are usually sufficient, but in violent emesis morphine may be required.

For insomnia and restlessness chloral at night in 38- to 54-grain doses, after having given 90 grains of some bromide salt during the day. A nutritious diet must be maintained during the abstinence period, aided by alcohol if necessary. Erlenmeyer (Annual, '88).

Hyosine hydrobromate employed, and morphine rapidly withdrawn by Erlenmeyer's method. Hurd (Med. Age, Feb. 25, '92).

Successful course in 150 cases: gradual reduction, cessation being unperceived by patient. Proteid diet. Glycero-acid phosphate as nerve-food. For insomnia, milk in large quantity or trional; also warm bath with cold to the head. As sedative, valerianate of zinc with extract of belladonna. As tonics, glyceride of hypophosphites, iron, quinine, strychnine, maltine, and coca-wine. Centric galvanization and general faradization. Special attention to rhythmical action of heart and tonicity of vascular system. Mann (Va. Med. Mthly., Aug., '95).

Literature of '96-'97-'98.

Hydrochloric acid administered during the morphine-taking period, in order to counteract the subacidity of the stomach. Erlenmeyer (Le Prog. Méd., Aug. 1, '96).

Potassium and sodium bromides are generally indicated to subdue the extreme nervous irritability, with henbane and cannabis Indica. The quantities administered must vary with the individuality of the case. Bearing this in mind, the formula appended may be taken as a guide:—

R Potass. bromid., gr. xx.
 Sodii bromid., gr. xx.
 Tr. cannabis Indic. fl., m. xv.
 Tr. hyoscyami fl., m. xv.
 Sp. ammon. aromat. fl., m. xx.
 Tinct. cardamom. co. fl., m. xx.
 Aq. destillat., ad fl. oz. iij.

When the patient can bear the immediate or almost immediate withdrawal of the drug, a much smaller dose of this mixture, repeated once or twice, will be ample. After a day or two tonic treatment can be begun.

Literature of '96-'97-'98.

After the withdrawal of morphine, a mixture—containing tinctura opii, 20 parts; tinctura iodini, 2 parts—is to be administered, 20 drops to be taken every two hours, day and night. Kaczorowski (Medycyna, Nos. 27 and 28, '97).

Purgatives, diuretics, and diaphoretics ought to be used concurrently. Under the influence of these medicines, and the rapid diminution of the quantity of morphine, the resumption of glandular activity begins before complete removal of the drug is enforced. Paul Sollier (La Presse Méd.; Canadian Jour. of Med. and Surg., Oct., '98).

Personal method of treatment of morphinism. First, sulphate of magnesia (salts) is given; then the patient is placed in bed. His hypodermic syringe and all opiates removed and concentrated tincture of hyoscyamus, concentrated tincture avena sativa (B. Keith & Co.), equal parts, 12 or 15 drops given every hour or two, as the symptoms indicate. W. S. Robinson (Med. Brief, Oct., '98).

Some authorities favor the administra-

tion of heroic doses of the bromides. I do not. With daily doses of from 60 to 100 grains of potassium or sodium bromide it is easy to so daze and inco-ordinate an inebriate that he becomes utterly helpless and totally unable to help himself either to drink or anything else. The injurious after-effects which I have seen to follow such treatment have been too grave to allow me to warrant such measures. The nervous systems of some individuals have been quite shattered by bromidism, the unfortunate sufferers having become complete neurotic wrecks. (See BROMIDES, volume ii.)

The crave for opium or morphine is dependent on an abnormal physical condition, which it has been claimed that sparteine and nitroglycerin relieve. It seems to me that all the benefit derivable there lies in their potency as cardiac stimulants. For this important part of the treatment—the stimulation and bracing of the heart—digitalis and strophanthus have, in my hands, been invaluable, especially the former. Sparteine is administered hypodermically, and nitroglycerin is given in tablets or in a 1-per-cent. alcoholic solution.

Believing that the craving is one of the symptoms of heart-depression, one or two granules of glonoin, each containing $\frac{1}{100}$ grain, given whenever the intense desire for morphine is experienced. The glonoin granules should not be swallowed, but allowed to dissolve on the tongue. Hammond (Denver Med. Times, July, '92).

In opium inebriety there is often severe and prolonged vomiting, during the earlier stages of treatment especially. When these symptoms are present I find it advantageous to administer the bromides in something like this form, for a few days, till the night draught can be retained:—

R Potass. bicarbonat., gr. cxx.
 Potass. bromid., gr. lx.
 Sodii bromid., gr. xxx.
 Tinct. cannabis Ind. fl., m. xxx.
 Sp. ammon. aromat., fl. dr. j.
 Tr. cardamom. co., fl. dr. j.
 Aq. destillat., ad fl. oz. vj.

M. Sig.: A sixth part three times daily in effervescence with an acid powder.

R Acid. citric., six powders of 15 grains each.

Sig.: The acid powders.

Tinct. nucis vomicæ should often be added to the above mixture in 3- to 6-minim doses.

Ice, milk and lime-water, or milk and soda-water will aid in counteracting the vomiting.

In most cases I begin the treatment with 4 grains of blue pill, following by a black draught or Sedlitz powder next morning.

In all cases great attention should be paid to the diet, which should be nourishing, easy of digestion, and such as will not be rejected by the stomach. Peptonized milk, beef-peptonoids, broths, soups, and similar preparations are good. As soon as it can be borne, white-fish, cut up fine with a little of the juice of a lemon, is very grateful. Fresh fruits and green vegetables are refreshing, and can be retained and assimilated. Fatty foods, when these agree, are of great value in the remedying of nerve-starvation.

The toxic effects of the poison are considerably mitigated by the gratification of a robust appetite. A generous consumption of nourishing food in some measure tends to protect the bodily organs from the poisonous influence. Unhappily the desire for, and the capacity to digest, nutritive food is generally impaired.

In certain cases the Turkish bath aids in procuring sleep as well as in soothing the nervous irritability. At other times these objects will be secured more easily and cheaply, occasionally more effectually, by the wet pack, which, however, must be carefully applied, or it will do more harm than good.

[Dip a sheet in hot or tepid water, the former being preferable. Wring the wet sheet well, and closely envelop the whole body (except the head and neck) in the sheet. Above this, leaving no part of the damp sheet uncovered, roll a blanket round the body. Then add successive wrappings of a couple or more blankets. The patient will generally be in a profuse perspiration within three-quarters of an hour. He should not be allowed to remain in the pack longer than 75 minutes, even when sleep has not been won.

The application may, in suitable cases, be repeated daily, or even every second or third day according to circumstances. To avoid any possible risk, the pack should be applied not less than two hours, or more than three hours, after food. I have seen an excellent calmative influence exerted on the opium addict by this simple and agreeable procedure. Whenever sedative soporific can be employed, in all forms of inebriety I prefer it to the exhibition of large doses of narcotic drugs for the purpose of securing sleep. NORMAN KERR.]

I pursue a similar course of treatment in morphine injection, the dose being steadily diminished day by day, with a weekly full narcotic dose of opium with belladonna, or chloral with bromides at night, instead of that day's reduced hypodermic dose.

Profession urged to substitute codeine for morphine whenever practicable. Mat-tison (Med. and Surg. Reporter, Oct., '91).

Muriate of codeine recommended as substitute for morphine in the cure by withdrawal. Rosenthal (Wiener med. Presse, Sept. 15, '90).

I never allow opium- or morphine-inebriates any alcoholic intoxicant beverage. There is danger of alcohol- or chloral- inebriety's being added to the opium habit.

Insurance and Morphinism.—Though opiomania and morphinomania are more difficult of cure than alcoholomania, pathological science has not as yet revealed any post-mortem appearances indicative of the grave organic degeneration and permanent structural alteration seen in the bodies of intemperate alcohol-takers. The particulars of some twenty-five cases afterward collected and published by Christison made known records of forty years' career of opiumism without any apparent physical hurt. It is true that there are recorded instances of long life in the person of excessive consumers of alcoholic intoxicants, but these are regarded as exceptions to the general rule that alcoholic intemperance shortens life.

Yet there can hardly be a doubt, in the opinion of the overwhelming majority of medical observers, that continuous excessive opium-consumption is subversive of good health, and therefore likely to induce premature decay. Decay following disturbance of function is the prominent feature of the opiumist's slow march to the grave. Some recent medical authorities, such as Sir William Moore and Dr. Farquharson have denied that opium-eating leads to premature death; and, in candor, I am bound to admit that I have not seen sufficient evidence to demonstrate those structural kidney changes which Dr. Mattison ("Opium-addiction as Related to Life-insurance," *The Doctor*, Dec., '90, New York) seems inclined to believe result from the immoderate use of opium. In opiumists and morphinomaniacs I have seen albuminuria present in less than 1 per cent. of my cases.

Mattison is of the opinion that, in striking contrast to the prevalence of transmission in the genesis of alcoholic inebriety, heredity plays but an insignificant part in the causation of opium-inebriety. I agree with this opinion in the main, if homogeneous or simple inheritance is meant, but disagree if transformed heredity be included. In my experience, a large proportion of those persons who "take to opium," and every variety of inebriants, inherit either the inebriate diathesis or some germane neurosis which is transformed into opium, chloral, or other intemperance in the descendant.

Dr. Mattison obtained from the medical officers of a number of large American insurance-offices the course pursued with proposals of insurance on the life of ex-opiumists. He found that the rule was to refuse, and demand a probation of from three to ten years, though some offices would not insure such lives on any terms. On the whole, giving due consideration to all the probabilities and risks, I would suggest that one and a half years of probation be required after one year's indulgence, three for two years; and thereafter six months for every two years of additional addiction ought to qualify for the acceptance of a life in other respects eligible for insurance. I would add the additional condition that the applicant be not above forty-five years of age on this probation.

NORMAN KERR,

London.

MORVAN'S DISEASE. See SPINAL CORD.

MOUNTAIN-FEVER. See TYPHOID FEVER.

MOUNTAIN-SICKNESS.

Definition.—This term is given to a series of symptoms resulting from diminution of the atmospheric pressure when high altitudes are reached. Though termed “mountain” sickness, it might also be called “balloon” sickness, since it also presents itself when high elevations are attained during aerial navigation.

Symptoms.—According to von Liebig, it affects persons unaccustomed to mountains at a height of 10,000 feet and upward. The symptoms are quick pulse, rapid breathing, and feelings of constriction and weariness; in higher degree, giddiness, nausea, loss of strength in the legs, finally engorgement of the venous system and the escape of blood from the superficial capillaries. The same symptoms may be caused, at lower levels, by violent exertion, but when they appear at higher altitudes without any or with very slight exertion, they are due to the rarefaction of the air. The expirations are unconsciously quickened under a lower atmospheric pressure; whereas, the greater pressure at lower levels affords greater resistance to the expired air, and thus makes the respiration slower.

The temperature is slightly raised—seldom over two or three degrees. When very high altitudes are reached, hæmorrhages from the nose, mouth, and ears occur.

Pathology.—The increased frequency of respiration at higher levels is involuntary, and the respirations become more shallow to compensate for it; hence the lungs become more contracted, and they accommodate less blood. Venous stasis and deficient oxidization ensue. Though less oxygen reaches the lungs when rarefied air is breathed, causing increased distress, this is not the main cause of the disorder. A person must be accustomed to the atmosphere of higher levels be-

fore a normal respiration occurs under the altered condition of atmospheric pressure.

MOUTH AND LIPS, DISEASES OF THE.

Catarrhal Stomatitis.

Definition.—An acute inflammation of the mucous membrane of the mouth usually caused by local irritation or occurring in the course of exanthematous diseases or prolonged febrile disorders.

Symptoms.—Although the entire buccal membrane may be involved,—that of the tongue, lips, and cheeks,—the labio-gingival region is usually the seat of the most active inflammatory manifestations. Redness, heat, tumefaction, furring of the tongue, and local discomfort constitute the symptoms witnessed in light cases; but in some, and particularly in infants, there is severe pain, sufficient, indeed, in the majority of cases to prevent nursing. Local pain also attends a form of stomatitis observed in nursing women. In severe cases of catarrhal stomatitis the tongue appears enlarged and the lingual papillæ project prominently. The saliva is greatly increased in quantity and is often sufficiently acrid to excoriate the lips and chin. Minute areas of the epithelial covering often become transformed into small, shallow, pultaceous, and quite painful ulcers, which are especially sensitive when touched or brought into contact with other mucous surfaces during mastication. Slight fever is sometimes present even in the condition occurring independently of infectious febrile disorders, of which catarrhal stomatitis is a frequent complication. The symptoms usually last from four to ten days.

In some instances the oral mucous membrane is dry, the inflammation manifesting itself by the presence of

heat, pain, and redness. This constitutes the "erythematous catarrhal stomatitis" of certain authors.

Literature of '96-'97-'98.

Measles is always accompanied by a mild erythemato-pultaceous stomatitis which sometimes disappears before the eruption, sometimes accompanies it, but always disappears with the rash. This stomatitis is characterized by a general, but moderate, swelling of the mucous membrane of the gums, cheek, tongue, and palate; a violaceous redness of all the parts with increased salivation; a pultaceous, creamy exudate which covers the surface and is easily removed by the fingers. This erythemato-pultaceous stomatitis may, in certain cases, serve as a point of diagnosis. Comby (*La Tribune Méd.*; *Med. Bull.*, Apr., '96).

Etiology and Pathology.—Catarrhal stomatitis may be primary or secondary. In the primary form the causative factor is a local irritant,—mechanical, chemical, or thermal,—which gives rise to excessive desquamation of the epithelium. Undue acidity of the oral secretions, unduly hot or cold foods, tobacco, strong condiments, fermenting or decomposing particles of food through insufficient cleansing of the mouth and teeth, etc., may give rise to the affection. In the secondary form the oral inflammation is symptomatic and often attends infectious diseases,—measles, typhoid fever, —and other exanthemata, and the prolonged fevers. It may also arise through continuity of tissue or by infection, owing to the presence in neighboring structure of an acute inflammatory disorder, such as tonsillitis, gingivitis, pyorrhœa alveolaris, etc. Gastric disorders are frequently complicated with catarrhal stomatitis. This oral disease may also occur as an evidence of general depravity of the organism, the result of unhygienic surroundings and poor food.

In the true catarrhal form thickening and softening of the mucous membrane is the most evident pathological feature: epithelial erosions covered with pultaceous masses of cells undergoing retrograde metamorphosis being observed in various spots in marked cases. The saliva is usually acid in reaction.

Treatment.—The internal administration of chlorate of potassium, frequently resorted to, is a pernicious practice in this form of stomatitis, owing to its evil influence upon the kidneys. Employed in saturated solution (about 1 drachm to the pint) as a mouth-wash, however, it is exceedingly useful. In many cases, borax, 10 grains to the ounce, is more effective, employed frequently during the day every half-hour and with especial care after eating. In infants the mouth should be gently cleansed after each feeding and a preparation of boric acid, 15 grains to the ounce of rose-water, applied with a swab, or, better, on a square piece of soft linen over the finger of the nurse. When mastication is difficult or very painful, the local application of a 4-per-cent. solution of cocaine to the sensitive spots affords great relief and enables the patient to eat comfortably. When the shallow ulcers resist less active measures they should be lightly touched with blue-stone or a weak solution of some of the silver salts, preferably the nitrate.

[In catarrhal stomatitis perfect cleanliness of mouth and nipples is of the utmost importance. The mouth should be cleansed after each feeding by cotton wrapped upon a small rod, or by inducing the child to suck ice-water from a piece of soft linen. Food, as far as possible, should be given cold, but the child should not be taken from the breast. Chlorate of potassium is useless and often harmful.

If the disease persist, the mouth should be penciled with a $\frac{1}{2}$ -per-cent. solution

of nitrate of silver daily, and cracks or ulcerations should be touched with the mitigated stick. L. EMMETT HOLT, Assoc. Ed., Annual, '90.]

Literature of '96-'97-'98.

In stomatitis ulcers may be touched with a tiny piece of absorbent cotton, which has been dipped in the following solution:—

R Borax, 45 grains.
Salicylate of sodium, 75 grains.
Tincture of myrrh, 1 drachm.
Syrup and water, of each, $\frac{1}{2}$ ounce.

The child should also take milk which has been boiled or sterilized. In ordinary erythematous stomatitis the child's mouth should be washed out, particularly after each meal, with this solution:—

R Borax, 30 grains.
Bicarbonate of sodium, 1 drachm.
Distilled water, 4 ounces.
Morain (Jour. des Prat., Aug. 15, '96).

Aphthous Stomatitis.

Symptoms.—In this variety of stomatitis there appear, besides the more or less marked inflammation of the oral mucosa, small, elevated, round or oval vesicles two to five millimetres wide, and surrounded by a red areola, which, as early as twenty-four hours after their appearance, form shallow, yellowish-white spots of ulceration, with bright-red margins. They may appear singly or in groups in any part of the mouth, but they are apt to appear in greatest number on the labial mucous membrane, along the external portion of the gums, inside the cheeks, and along the edges of the tongue. They are much more painful than those observed in the catarrhal form, and render nursing or the taking of food very difficult. The aphthæ sometimes extend to the fauces.

The general symptoms are somewhat more marked than in the previous form. Slight fever, anorexia, furring of the

tongue, and heavy breath represent, however, about all the manifestations usually witnessed. Although there is an increased flow of saliva, the latter is never fœtid (Holt). The pain attending the presence of the ulcers especially renders the child cross and fretful when food is taken, but the active nervous manifestations of the more severe forms are absent. In the form observed in connection with febrile diseases the general symptoms are obviously those of the causative affection. Aphthous stomatitis tends to recur when the primary general cause is not completely removed.

Etiology and Pathology.—Aphthous stomatitis is usually observed in children under three years old. It is a frequent complication of gastro-intestinal disorders and is often seen in debilitated or poorly-fed subjects. It is most frequently met with in conjunction with, or as a sequel of, some febrile diseases, especially the acute exanthemata.

Local outbreaks of aphthous stomatitis have been traced to milk of cattle infected with foot-and-mouth disease (Ollivier), but the claim of Siegel that the cause of the disease in man and the lower animals is the same has not as yet been accepted.

No parasite special to the affection has as yet been isolated.

Treatment.—The treatment of this condition does not differ from that previously described. Holt states that each ulceration may be touched with nitrate of silver, but that no other active measures should be employed. The disease tends to spontaneous recovery in from seven to fourteen days. Goppert has recently (Jahrb. f. Kinderh., Jan., '99) recommended orthoform as a local anæsthetic, the powder being simply blown over the diseased areas, after cleansing the whole oral cavity. Food should

only be used fifteen minutes after each application. Marfan resorts to frequent washing of mouth with a saturated boric acid or a 1 to 500 solution of carbolic acid. To the ulcers he applies a 5-per-cent. solution of nitrate of silver, a 1 to 500 solution of permanganate of potassium, or a solution of iodine and iodide of potassium in glycerin and water.

The following preparation is much employed by French clinicians:—

℞ Borax, 4 parts.
Tincture of benzoin, 2 parts.
Distilled water, 10 parts.
Syrup, 20 parts.

M. To be applied five or six times a day.

Ulcerative Stomatitis (Fœtid Stomatitis; Putrid Sore Mouth).

Definition.—Inflammation of the mucous membrane of the mouth and underlying structures attended by the formation of a deep ulcer which usually develops in the gum about the lower incisors. It only occurs when there are teeth (Forchheimer).

Symptoms.—Ulcerative stomatitis generally develops near the edge of the gum immediately above the labio-gingival sulcus. The area affected is at first red and tumefied and very sensitive. A deep, pus-secreting ulcer having a red areola, surrounded, in turn, by a zone of œdema, is soon developed. In some cases this ulcer reaches down to the periosteum, and is followed by necrosis of the alveolar process. The gingival mucous membrane becomes softened and spongy and the teeth are loosened. Although the inflammatory process may invade all the tissues of the mouth, the ulceration rarely extends beyond the anterior portion of the gums. Occasionally the membrane of the cheek opposite the ul-

cerated area also ulcerates. The breath becomes intensely foul, and slight gingival hæmorrhages cause the profuse saliva secreted to appear bloody. Severe pain is experienced during mastication. There is swelling and pitting of the tongue and enlargement of the submaxillary glands. Vomiting, diarrhœa, and marked fever are usually present, and an exanthematous eruption resembling that of measles is occasionally observed. In children the disease sometimes culminates fatally, especially when unhygienic environments and unwholesome food cannot be replaced by improved conditions, the disease being one denoting a depraved state of the general organism.

Etiology and Pathology.—That a specific micro-organism must exist is emphasized by the occasional prevalence of ulcerative stomatitis as an epidemic disease in institutions, barracks, camps, and prisons, especially when the sanitary conditions are defective and where poor food is supplied. Squalor in all its forms tends to promote its appearance, cold, damp, and defective ventilation being among the many predisposing elements. Insufficient care of the mouth, especially when tartar is allowed to accumulate around the teeth, carious teeth, or decaying roots, infectious diseases, congenital heart affections (Duckworth), scurvy, saturation of the system with lead or phosphorus are among the most frequent etiological factors known.

In a series of 30 cases recently examined by Bernheim and Popischill (Wiener klin. Woch., No. 27, '97) two micro-organisms were found in the ulcers in all the cases, a bacillus and spirœchæte, both being mobile. Attempts to cultivate them failed. Besides these organisms, which were always present, there were usually also streptococci and staphylococci in addition to the organ-

isms generally found in carious teeth: *leptothrix buccalis*. The specific organism of ulcerative stomatitis may still be considered as unknown, however.

Treatment.—In this affection chlorate of potassium may be given internally, 2 to 5 grains three times a day to a child, and also applied locally in the form of a mouth-wash, the saturated solution being employed. This constitutes a truly specific treatment, the disease being thus readily controlled.

[In stomatitis ulcerosa chlorate of potash is almost a specific. It is best administered in a 3-per-cent. solution with a little syrup, $\frac{1}{2}$ to 1 teaspoonful being given every two hours. Its toxic effects, if used in too large quantities, should not be forgotten. It usually produces considerable pain, but this soon ceases, and is a positive index of the curative effect of the drug. In obstinate cases the application of a solution of nitrate of silver may hasten recovery. L. EMMETT HOLT, Assoc. Ed., Annual, '90.]

A 1-grain-to-the-ounce solution of permanganate of potassium is sometimes required to counteract the foul breath, and the nitrate-of-silver stick applied to the edges of the ulcers hastens recovery. Peroxide of hydrogen, 1 drachm to the ounce, is preferred by some clinicians as a mouth-wash. Care should be taken to preserve teeth that are loosened by special attention to the surrounding gums; the latter should, besides being kept scrupulously clean, be occasionally painted with a 20-grain-to-the-ounce solution of alum. Pieces of necrosed bone occasionally keep up the ulcerative process. The cavity from which the pus oozes should be carefully probed and surgical removal resorted to if needed. A tonic treatment should be instituted. The syrup of iodide of iron is especially valuable; codliver-oil is preferable in poorly-nourished children. Hygienic

surroundings and wholesome food should be insured.

Best treatment of stomatitis ulcerosa consists in gargling the mouth with a solution of chlorate or permanganate of potassium before and after meals, and in inserting afterward an iodoform-, boric-, or salicylic- gauze compress between the cheek and gums on the diseased side. This compress is removed before partaking of a repast, and renewed afterward, care being taken always to use the gargle before inserting the gauze. Orak-hovatz (Provincial Med. Jour., June 1, '94).

Parasitic Stomatitis (Stomatitis Mycose; Thrush; Sprue; Muguet; Soor).

Definition.—A disease characterized by the formation, upon the mucous membrane of the mouth of pearly-white spots or flakes which gradually increase in size and spread to adjoining structures and organs.

Symptoms.—This form of stomatitis usually begins upon the tongue, and, spreading in every direction, may gradually involve the lips, the cheeks, the palate, the gums, the tonsils, the pharynx, the larynx, and even the gastrointestinal tract down to the ileo-cæcal valve (Parrot). The superficial lesion appears as small, grayish-white spots, surrounded by a zone of blood-vessels. These soon become elevated, increase in size, and often coalesce to form a false membrane; this, in some instances, has a characteristic filmy, or lace-like, look; in others it simulates a thick, friable pseudomembrane (Holt). These areas or flakes may readily be brushed off, leaving no appreciable mark upon the surface from which they were removed. Sometimes the flakes appear yellowish or brown, and the seat of implantation bleeds, shallow erosions being then perceptible. The constitutional symptoms are less marked than in the other forms,

the local manifestations being comparatively benign. Indeed, dryness of the mouth and local heat, difficult nursing or feeding owing to more or less great tumefaction and stiffness of the mucous structures represent about all the discomfort complained of. Still, the disease is a stubborn one and the lesions may persist for months. A fatal issue is occasionally witnessed in debilitated children.

Epidemic of stomatitis in the Maternity Hospital of Blackwell's Island, beginning at birth or soon after.

The pearls constituting this form of stomatitis were small, white, globular tumors, varying in size from a pin-head to a millet-seed, and numbered from one to five in each case. They were hard upon the outside and soft within. They were imbedded in the mucous membrane, and were usually covered with condensed subepithelial connective tissue, which merged into the surrounding tissue without any distinct line of demarkation. They were composed of epithelial cells, like those of the mucous membrane of the mouth. Garrigues (Med. News, Oct. 1, '92).

Etiology and Pathology.—The primary factor in the development of parasitic stomatitis is an abnormal condition of the oral mucous membrane, the *Saccharomyces albicans*: long branching mycelium filaments requiring an acid medium and at no time developing upon the normal mucosa. Such a condition may be especially brought about in infants by unclean feeding-bottles when impaired general nutrition co-exists. Sweets, fermenting bits of acid food, and uncleanliness of the mouth may act as exciting causes by acidifying the normal secretions: a condition which the growth of mycelium intensifies. The transmission of the thrush-spores by means of feeding-utensils, spoons, cups, feeding-bottles, etc., accounts for the epidemics occasionally observed.

The predisposing factors are mainly those which tend to lower the general vital tone: the exanthemata, hereditary syphilis, etc.; but it may also appear in apparently robust children. Parasitic stomatitis is likewise met with in adults as a complication or sequel of infectious fevers and diathetic diseases: cancer, tuberculosis, etc.

The fungus develops among the epithelial cells and acini of the mucosa, forming a dense net-work. It may readily be recognized microscopically if the diagnosis be at all doubtful.

Treatment.—Prophylactic measures are first in order, the causative factors being eliminated as far as possible. Cleanliness of the mouth and of all utensils used and sterilization of feeding-bottles and all other feeding-implements are imperative, to prevent reinfection each time these are used. This should be done gently, but thoroughly, four or five times a day. The next step is to counteract the acidity of the oral secretions by the frequent use of alkaline washes and beverages. Borax, 20 grains to the ounce; sulphite of soda, 60 grains to the ounce; a saturated solution of chlorate of potassium, or pure lime-water are useful as mouth-washes. In some cases, especially where fœtor of the breath is present, a 1-grain-to-the-ounce solution of permanganate of potassium is more effective. The atomizer may be used when the patient is too young to handle swabs or rinse his mouth. These measures should be repeated every hour.

To alkalinize the beverages, lime-water may be added to the milk, in the case of infants, in the proportion of 1 to 4.

Sugar and sweets, starchy food, and all syrupy excipients when remedies are prescribed should be avoided. The systemic state requires careful attention:

indeed, thrush sometimes persists, notwithstanding all local measures, until a change of air, good food, and tonics have greatly improved the general health. Minute—i.e., tonic—doses of calomel or bichloride of mercury are valuable in this connection.

[Complete mechanical removal of the thrush is absolutely necessary. This is aided by an alkali, and bicarbonate of soda (1 teaspoonful to a cup of water) is one of the most efficient. Borax and honey, or any mixture containing syrup, only adds fuel to the fire. Calomel in small doses, or corrosive sublimate well diluted, acts almost as a specific in intestinal disorders due to thrush. L. EMMETT HOLT, Assoc. Ed., Annual, '90.]

Gangrenous Stomatitis (Noma; Cancrum Oris; Wangenbrand).

Definition.—A disease usually observed in children, from two to five years old, in which a gangrenous process begins on the gums or inner side of the cheek and spreads with rapidity.

Symptoms.—Gangrenous stomatitis begins almost always during convalescence from an acute febrile process in unusually debilitated children, the first lesion being a small nodule, dense and sensitive, appearing on the gum or the cheek. The skin and the neighboring mucous surface becomes rapidly hard and swelled or there is œdema. There may be pain, but, as a rule, little discomfort. In mild cases the primary ulceration may be limited to one of the starting-points and finally heal under local treatment, leaving the parts deformed and the patient disfigured if penetration of the cheek has occurred; but in the vast majority of instances the necrotic process rapidly extends, the cheek is perforated, and the chin, the tongue, the jaws, and remote structures—such as the eyelids and ears—are involved in the destructive process.

Violent systemic manifestations are present. There is marked fever and practically intractable diarrhœa, the breath becomes intensely foul, and the submaxillary and cervical glands are more or less enlarged. The prostration soon becomes alarming and all the evidences of fatal marasmus appear. The disease is usually fatal in from one to two weeks, but the patients are often carried off by affections that appear as complications: aspiration pneumonia, pulmonary gangrene, enterocolitis, endocarditis, etc. In short, the phenomena are those of a violent septicæmia.

Etiology and Pathology.—The affection occurs in poorly-fed children, especially girls living in damp, filthy quarters, and children recovering from various infectious diseases, especially measles, scarlatina, diphtheria, and typhoid fever. It is essentially a disease originating primarily in lowered vitality, and is not observed in vigorous healthy children.

The complications observed are usually ascribed to metastatic infiltration of the distant structures involved, except in the case of pneumonia, which is due to aspiration of gangrenous matter, and enterocolitis, due to the ingestion of gangrenous *détritus*. A bacillus resembling that of diphtheria has been isolated by Bishop, Ryan, and Schimmelbusch; Babès and Zambilovici have also isolated a pathogenic organism capable of producing gangrene resembling noma in rabbits; but all these observations require further investigation.

[During the past year twenty-four cases of noma under care, in patients from six months to eight years of age, all the children of poverty-stricken people living in the highly-malarial city of Peking. The left cheek was the favorite site of the gangrenous spots, but in several cases the disease first appeared in the gums in the median line, destroying them and the alveolar process rapidly.

All the cases presented markedly-enlarged spleens and profound anæmia and proved fatal. R. COLTMAN, Corr. Ed., Peking, China, Annual, '96.]

Literature of '96-'97-'98.

Bacteriological examination in two cases of noma. In the first case bacilli and cocci were found, the former being very numerous in the necrosed portions and penetrating but little into the neighboring parts, while the cocci had penetrated deeply into the lymphatics of the surrounding healthy parts. Cultures yielded a liquefying staphylococcus and but a single bacillus, staining by Gram's method and resembling the bacillus of diphtheria. Neither of these organisms proved pathogenic to guinea-pigs. In the second case a bacillus exactly resembling that in the first case was found. This bacillus differs markedly from the bacillus of noma as described by Schimmelbusch. Lyder Nicolaysen (Norsk Mag. f. Laegevid., p. 137, '96).

Treatment.—Prophylactic measures are also of primary importance in this form of stomatitis. The child's diet should at once be changed to one calculated to increase general nutrition. Nux vomica and gentian, combined, and in small doses, or strychnine are advantageous to promote appetite. Strong beef-juices, peptonized milk, or koumiss should be given every two hours.

The local treatment consists in the destruction of the sphacelous areas by caustics after thorough cleansing. For the latter purpose a 1-grain solution of permanganate of potassium is very useful, but peroxide-of-hydrogen, bichloride-of-mercury, or carbolic-acid solutions are preferred by some. These may be applied with an atomizer giving a coarse spray. The sloughs must be thoroughly removed and the bottom of the ulcer fully exposed. This being accomplished, a 10-per-cent. solution of cocaine is applied to the wound, and

after four or five minutes the latter is touched with pure lactic acid by means of a small cotton pledget wrapped around the end of a thin probe (Sajous). Every part of the cavity must be cauterized. This is to be repeated daily until signs of resolution appear. Nitric acid, galvanocautery, and the Paquelin cautery have also been recommended, but their use is more difficult. Excision, under anæsthesia, is a safe and useful procedure. Bromoform or bismuth subnitrate are valuable to enhance the curative process when dusted on the cauterized ulcers. Scrupulous cleanliness of the mouth is imperative.

MERCURIAL STOMATITIS. (See MERCURY, volume iv.)

Anomalous Forms of Stomatitis.

Membranous, or Croupous, Stomatitis.

—True croupous stomatitis is always a complication of croupous angina, the membrane developing simultaneously with that of the tonsils. Diphtheritic stomatitis is rarely primary, but a complication of diphtheria of the fauces (Holt).

Literature of '96-'97-'98.

Attention drawn to importance of diagnosing diphtheritic noma early, with a view to its treatment by antidiphtheritic serum. Though the casual relation of the bacilli to the disease is not actually proved, it is believed to be a not uncommon occurrence. Freymuth and Petruschky (Deut. med. Woch., Sept. 22, '98).

What is often called "membranous stomatitis," however, is but an aggravated form of aphthous stomatitis. The local inflammation is more intense, the aphthæ assume a development suggesting the presence of a diphtheritic pseudomembrane, while the ulcer, when the latter is removed, is deeper and larger. It is mainly observed in infants

suffering from inherited syphilis or gonorrhœal infection. In the adult it is occasionally caused by the local use of strong caustics. The treatment does not differ from that of aphthous stomatitis, care being taken, however, to remove as far as possible the causative disorder.

Foot-and-mouth disease, or aphthous fever, an affection observed in cattle, is occasionally witnessed in the human being, particularly in children, the toxic element being transmitted through contaminated milk, cheese, or butter. There is marked fever and gastro-intestinal and bronchial irritation; a vesicular eruption appears upon the lips, mouth, and pharynx early in the history of the disease. The tendency to hæmorrhage is greater than in ulcerative pharyngitis. The mortality in a recent epidemic studied by Siegel was 8 per cent. The treatment indicated is that recommended in the ulcerative form.

Foot-and-mouth disease as found in Spain is a highly contagious malady, and may affect not only the foot and mouth, but also the mucous membrane of the bronchi, stomach, and intestines, giving rise to symptoms resembling typhoid fever. Infection is transmissible from animals to man, but it is purely local, and does not reside in the flesh of the affected animals. Grinan y R. Turró (Gaz. sanit. de Barcelona, Mar., '93).

Bednar's Aphthæ.—This is characterized by the presence, over the hard palate near the gums of infants, of white patches, or aphthæ, which sometimes overlie deep ulcers. It is usually ascribed to the use of artificial nipples or to traumatism, such as that produced when the mouth is roughly cleansed by the nurse. This form of stomatitis is overcome with difficulty. A shorter and softer nipple should be ordered when this cause is apparent and the measures

indicated in ulcerative stomatitis resorted to.

Investigations of the various forms of stomatitis, known as the aphthæ of Bednar, aphthæ of the palate, or *plaques pterygoïdiennes*, shows the patches to be classical instances of so-called mycotic epithelial necrosis induced by the invasion of bacteria into the superficial epithelial layer of the palate in the region of the pterygoid processes. The gradual detachment of the necrotic epithelium gives rise to ulceration, facilitating the entrance of other micro-organisms, with the possibility of mixed infections. While in most cases the affection is purely local, with not inconsiderable local manifestations, it may become general through the medium of the lymphatic system. E. Fraenkel (Inter. klin. Rund., Aug. 16, '91).

Riga's disease has been observed almost exclusively in the southern provinces of Italy, where it seems to be endemic, occasionally attacking all the children in a family, whether the parents be healthy or not. It is observed: when the first teeth make their appearance, apart from whooping-cough, sometimes in children whose general health shows nothing wrong, sometimes in cachectic children who are exhausted by ordinary attacks of gastro-intestinal catarrh. It begins as an ulceration under the tongue, close to the frænum. It is about the size of a flaxseed, and gradually enlarges to the size of a sixpence. It is gray in color and painless. The border is irregular and not sharply marked, and extends somewhat over the sound tissue. It may cause death, or, after a long time, recovery may take place. The children waste in flesh, their skin becoming of an earthy hue. Enlargement of the liver and spleen occur. There is no fever. Beginning at the age of three or four months, it frequently lasts until the twentieth month. It is mostly hereditary, and only seldom do the children

of such families live, unless nursed at the breast of a healthy woman.

Autopsies of cases of Riga's disease show slight hydrocephalus (subarachnoid), and fatty degeneration of the liver and of the cortical substance of the kidney. Characteristic bacilli discovered in the organs of the child and the milk of the mother. Pianese (*Riforma Medica*, p. 627, '92).

Literature of '96-'97-'98.

Judging from results of histological examination, Riga's disease is a local lesion: a sort of traumatic ulceration directly connected with the rubbing of the inferior surface of the tongue on the sharp edges of the two lower incisors, the repeated friction being considered as the probable cause of the papillary appearance of the ulceration. F. Brun (*Annual*, '96).

Parrot's Disease.—This disorder is observed in the newborn and is characterized by the presence on both sides of the middle line of the hard palate of symmetrically-disposed ulcers which tend to increase in size. The ulceration often penetrates the underlying soft tissues to the bone, causing necrosis. It is a stubborn affection and requires the active measures advocated under ulcerative stomatitis.

Herpes zoster, or zona, of the mouth as described by Hugenschmidt, is an inflammatory affection of one part and only one side of the buccal cavity, characterized by an eruption of herpetic vesicles, disposed in groups according to a regular direction. The eruption is preceded and accompanied by a neuralgic pain of the whole fifth nerve. The evolution of the disease may be divided into two periods: (1) the period of invasion; (2) the period of eruption. 1. Period of invasion begins by a rise of the temperature: there is fever; then headache, nausea, loss of appetite, etc.; intense

neuralgia of the whole region of the fifth nerve. Fever lasts three days, and is followed by the period of eruption. 2. In period of eruption parts to be involved become excessively painful to the touch; mucous membrane is red and presents a series of little herpetic vesicles, disposed in groups and having size of a pin's head; some of them are united. They assume a regular direction: usually the course of the nerve. No vesicles are to be found disseminated in the mouth. The neuralgia, which is general for the first three days, localizes itself as soon as the eruption occurs.

Very similar is a disorder described by Jacobi, also characterized by an herpetic eruption, and observed in neurotic subjects. In some cases it accompanies erythema multiforme. The treatment indicated is that of the general disorder.

[Herpes zoster involving the mouth, pharynx, larynx, and especially the epiglottis has occasionally been observed and described—one case by me (*Phila. Med. Jour.*, '98) and one by Joseph S. Gibb (*Phila. Polyclinic*) and others. These cases were accompanied by generalized zona. J. MADISON TAYLOR.]

Literature of '96-'97-'98.

Case of stomatitis which followed the administration of antipyrine. The man was suffering from rheumatic neuralgia and was given antipyrine in mixture. On the next day three or four patches of superficial stomatitis appeared on the buccal mucous membrane and two or three on the hard palate. No erythematous rash appeared. Only forty grains of the drug was given. C. K. Martyn (*Brit. Med. Jour.*, Sept. 17, '98).

Lips, Diseases of.

Inflammation, Cracks, and Fissures.

Inflammation frequently occurs independently of oral or general affections as a result of cold during the winter months. When the slight vascular turgescence present is complicated with

cracks or fissures, considerable discomfort results. Of diagnostic importance, however, is the fact that fissures, which are usually situated in the middle of the lips, often betoken a strumous diathesis; enlarged cervical glands are usually present in such cases, however. Again, cracks at the angles of the mouth suggest the possibility of general syphilis; the surrounding tissues in that case often appear soddened, while the fissure is apt to contain pus. Labial fissures are also often witnessed in women who, in threading a needle, first bite the thread and drag it between the lips before passing the tip through the eye (Jamieson).

Treatment.—Uncomplicated congestion of the lips soon yields to mild astringents or to a preparation such as the following, in which a resinoid substance is contained:—

R Tinct. of benzoin, $\frac{1}{2}$ ounce.

Glycerin, $\frac{1}{2}$ ounce.

Rose-water, enough to make 4 ounces.

When slight fissures or cracks are present, rose-water ointment or 10 grains of salicylic acid to the ounce of cold cream usually bring about prompt resolution. Fissures often resist all simple measures, and require the application of solid nitrate of silver. In children persistent fissures leave deep furrows, and are apt to produce slight deformities. They should therefore be scraped with the curette under local anæsthesia, and the edges of the wound be drawn together and held in position by means of court-plaster until healed.

In tabulation of ninety-eight cases of extragenital chancre, it is found that the lips are by far the most common seat of these lesions. Neumann (*Inter. klin. Rund.*, Apr. 10, '92).

HERPES LABIALIS (FEVER-BLISTER).
See HERPES FACIALIS, vol. iii.

Tumors of the Lips.

Of all primary neoplasms, about 3 per cent. originate in the lips; but these structures show a higher percentage when cancer is alone considered: *i.e.*, about 5 per cent. As compared to other forms of tumor observed in this region,—papilloma, sarcoma, angioma, fibroma, and cystoma,—cancer is observed in 99 per cent.

Carcinoma.

This variety of growth almost exclusively develops in the lower lip. Of 352 cases analyzed by W. R. Williams (*Brit. Med. Jour.*, Apr. 11, '92), 340 originated from the lower lip. Of 1193 instances recently studied by Fricke (*Deut. Zeit. f. Chir.; Ther. Gaz.*, May 15, '99), the upper lip was affected in but 63 instances. The predilection of this situation for the development of cancer as regards sexes is as striking. In the series of cases just mentioned 94 per cent. occurred in males. It is essentially a disease of adult and advanced life, the average being about 60 years; but carcinoma has been observed long before the fortieth year: the limit usually accepted. Fricke's list ranged from 24 to 83 years. A large proportion of the cases were in laborers and farmers, and heredity seemed to play a minor rôle. Pipe-smoking appeared to be an important predisposing factor, wounds and abrasions coming next in order.

Symptoms.—A labial cancer may begin as a mere excoriation, fissure, or ulcer, that will not heal; a small tubercle covered by a thick scab that recurs as soon as picked off; or as a warty growth. The ulceration gradually spreads and deepens, the surrounding tissues being infiltrated and hard. In many cases the carcinoma begins as an ulcerating induration. The ulcer gradually assumes the typical appearance of an epitheliom-

atous growth, with an irregular sloughing base and abrupt everted edges. When irritated by the injudicious use of caustics or "specifics," it tends to fungate and its growth becomes more rapid. At this stage it usually becomes quite painful, and nutrition soon suffers through the inability of the patient to take sufficient food, and a state of marasmus soon becomes evident, owing to repeated hæmorrhages, the ingestion of cancerous *detritus*, etc. General toxæmia is by this time fully demonstrated by the patient's facies, and he sinks with increasing rapidity until death relieves him of his suffering. As a rule, the development is very gradual, and the glands of the jaws are not involved early. Enlargement of these glands and even their induration does not necessarily imply carcinomatous infiltration. Glands examined immediately after removal have been found free of malignant degeneration (Fricke); but there is no doubt that such glands constitute foci for carcinomatous changes and that they should be removed whenever possible.

Diagnosis.—Chancre of the lip sometimes renders the diagnosis somewhat difficult. Carcinoma, as we have seen, occurs almost always in men; chancre is more frequently observed in women than in men, and may occur at any age, while cancer seldom occurs before the fortieth year. The progress of cancer is slow and the involvement of lymphatic glands is tardy; chancre advances rapidly, lasts but a few weeks, and the glands are soon involved. Finally the secondary manifestations appear in syphilis and greatly improve under specific treatment. Cancer progresses regardless of all internal remedies.

Prognosis.—In Fricke's statistics operative procedures resulted as follows:

8 per cent. died as an immediate result of the operation, 32 suffered from recurrence, and 60 per cent. were permanently cured. The prognosis of labial cancer is therefore good if operation is resorted to—before, however, the maxillary and parotid glands are involved in the cancerous process. The prognosis is also unfavorable when the infiltration has reached the jaw or has extended to neighboring organs.

Worner collected, from 1843 to 1884, 866 cases of labial cancer which had been operated. Of these 28.1 per cent. recovered permanently. Maiweg in his thesis collected 182 operated at the Bonn clinic from 1866 to 1887. Of these 57 recurred and died; 44 recovered, but had not yet completed the third year after the operation; 32 have passed the third year since the operation without recurrence; 49 have already completed the sixth year since the operation and have not relapsed. Forgue (*Gaz. des Hôp.*, Mar. 25, '90).

Treatment.—Local treatment by caustics and other "specifics" but compromise the ultimate issue. Surgical removal resorted to early affords the patient excellent chances of recovery. Of all cancers, that of the lip has shown the least tendency to recur. The operative technique is described under PLASTIC SURGERY in this volume.

Miscellaneous Growths.

Besides the varieties of neoplasms enumerated and which do not depart, in the physical phenomena, from similar neoplasms observed elsewhere in the organism, NÆVI are sometimes witnessed in this location. But, as a rule, they are small and may generally be removed by ignipuncture, a fine galvanocautery-knife being used, or by electrolysis. The latter is slower, however. Dissection, as if the growth were a malignant one, is sometimes necessary.

For deformities of lips and mouth, see PLASTIC SURGERY.

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MOVABLE KIDNEY. See URINARY SYSTEM.

MUMPS. See PAROTITIS.

MUSCLES, DISEASES OF.

Progressive Muscular Dystrophies.

This is a general name applied by Erb to several clinical types of progressive muscular degeneration with or without preliminary hypertrophy, involving various groups of muscles, and due to primary morbid changes in the muscles themselves. The disease is markedly hereditary in type. Erb subdivides the progressive muscular dystrophies into two classes:—

1. *The progressive muscular dystrophy of infancy.* This includes the hypertrophic form, formerly known as *pseudo-hypertrophic muscular paralysis*, which really represents two types: (a) one in which the hypertrophy is fictitious, the muscles having undergone lipomatosis, and (b) one in which the hypertrophy is real, the muscle-fibres having become enlarged.

The atrophic form, consisting, in turn, of two types: (a) the *infantile type of progressive muscular atrophy* of Déjerine-Landouzy, in which there is muscular atrophy of the face, shoulder, and arm (infantile form of Duchenne), and (b) a form in which the face is not involved.

2. *The progressive muscular atrophy of youth and adult life,* Erb's juvenile atrophy, which usually begins in the scapulo-humeral muscles.

Symptoms.—The earliest manifestations of the disease denote impairment of muscular power. The child's move-

ments become awkward, and resort must be had to various stratagems to accomplish what previously was done without difficulty. In climbing stairs, for instance, the patient finds it necessary to grasp the banister, while he pulls himself up with his hands. To rise from the ground he is obliged to first get on his hands and knees, partly raise the body by straightening the legs, then gradually reach the upright position by using his lower limbs as supports for his hands,—“climbing his legs,” as it were, —Gowers's pathognomonic sign. While standing, his legs are apart, the body is bent backward, and the abdomen projects. His gait is waddling and he frequently falls.

After a period, varying greatly in different cases, enlargement of some of the muscles becomes noticeable. The muscles of the calves are usually the first to be affected. The extensors of the thighs, the muscles of the nates (glutei), of the arms and of the back (the deltoid, triceps, infraspinatus, and latissimus dorsi) are usually the next to become involved, singly or in various groupings, each affected muscle standing out prominently. The patient's limbs and body may thus become very irregular in outline, one calf appearing much larger than the other, the muscles of one arm appearing unusually developed for the size of the forearm, etc. This becomes especially noticeable when, as usually happens, atrophy of adjoining muscles simultaneously occurs.

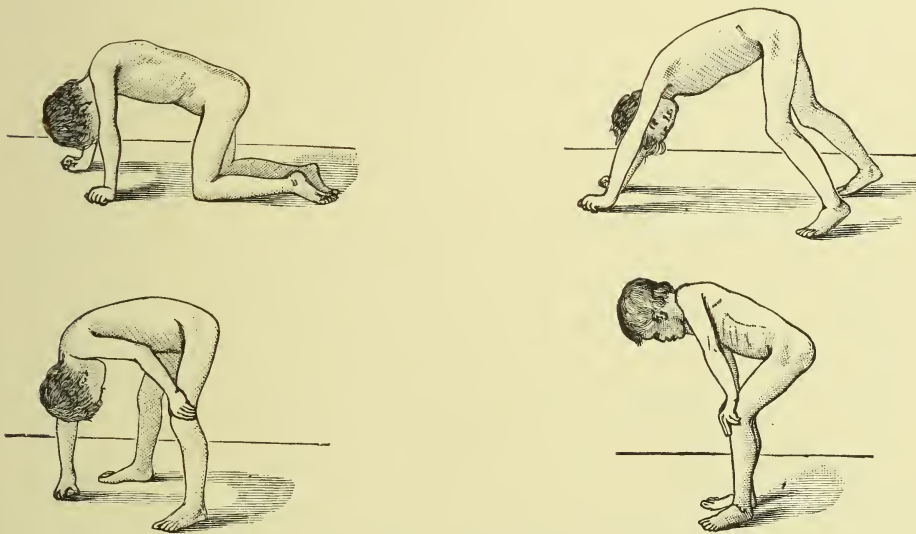
There is no electrical degenerative reaction, but the latter may be diminished in proportion to the muscular weakness present. The hypertrophied muscles are often, however, unusually strong.

The Déjerine-Landouzy type begins, usually, in the face, and gives the latter a typical appearance due to thickening

of the lips, described as the "tapir-mouth."

"Loose shoulders" is a symptom upon which Erb lays considerable stress. When an attempt is made to raise the child by placing the hands under his arms, the shoulders are alone raised until the level of the ears is reached; the child's head and neck sink between them, as it were, and the body seems to slip down between the hands. The scapulæ usually stand out prominently from the spinal column, resembling wings on the point of being spread.

tracture of some of the muscles gives rise to deformities: contracture of the calf-muscles, for instance, so raises the heel as to prevent its apposition to the floor. Club-foot, spinal curvature, etc., may thus be brought about. Again, weakness of the muscles may cause lordosis, or lateral deviation of spinal column, the patient being unable to stand or even to sit upright. No sensory symptoms are present. Mental torpor is sometimes, and epileptoid spasms occasionally, observed. Increasing loss of physical power usually attends these cases, and death supervenes



Attitudes assumed during attempts to rise. (*Gowers*.)

Case in a female aged 57. Many of the muscles of the back, the arms, and abdomen were much enlarged and hard to the touch. The affected muscles reacted feebly to the faradic current. When an excised portion was examined, the fibres were found to be twice as large in diameter as normally; the interstitial tissue was not increased, and there was no trace of fat-cells. The fibres were transversely striped in most cases; one or two, however, showed longitudinal markings. Fulda (*Dent. Archiv f. klin. Med.*, B. 54, H. 6).

Later in the history of the disease con-

after a period of general marasmus. Some cases never reach the advanced stages of the disease; they merely complain of localized or general weakness, and die of intercurrent diseases; others rapidly show its active manifestations and die early: the *forme fruste* of French clinicians.

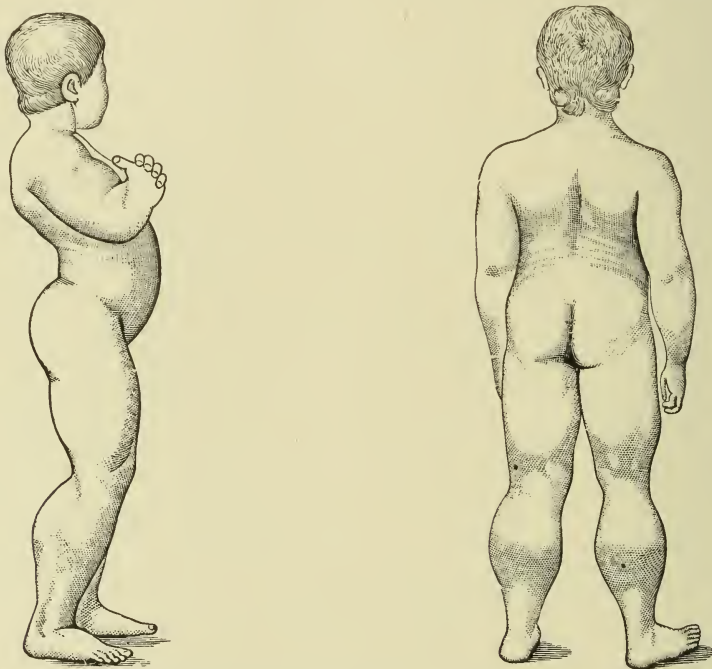
Etiology.—The muscular dystrophies can generally be traced to heredity, the disease being usually transmitted through the mother, though she may not suffer from the disease herself. Thus, all the

children of a woman by different husbands have suffered from the malady. It may occur successively in two or more generations or merely show a family tendency by attacking only some of its members through several generations. A large number, twenty to thirty, have been traced in but five generations. The disease usually appears early in life, very seldom after the twenty-fifth year. Males are more frequently affected than females.

reaction is present. It begins late in life, and heredity is by no means a common etiological factor.

PROGRESSIVE MUSCULAR ATROPHY OF NEURAL ORIGIN first shows itself in the smaller muscles of the extremities. There is a noticeable decrease in the electrical excitability, while fibrillary contractions and sensory symptoms are present.

MUSCULAR ATROPHY FOLLOWING NEURITIS.—A history of lead poisoning or other factors capable of causing neu-



Pseudohypertrophic paralysis. (Duchenne.)

Diagnosis.—In sufficiently advanced cases the diagnosis is not difficult, especially when hypertrophy of one or more muscles is present. When this distinctive feature is absent, however, confusion with other forms of progressive atrophy is possible.

PROGRESSIVE MUSCULAR ATROPHY OF CENTRAL ORIGIN.—In this form the small muscles of the hands are usually the first to atrophy. The degeneration-

itis shows the latter to be the primary disorder. Heredity plays a subsidiary rôle, and paralysis is more evident than true atrophy. The "steppage" gait of peripheral neuritis is present when the muscles of the legs are involved.

MUSCULAR ATROPHY OF TRAUMATIC ORIGIN.—There is a clear history of direct injury, fracture, contusion, etc., impairing directly or indirectly the nutrition of the affected group of muscles.

The anatomical relations between the region injured and the atrophied muscles usually render the diagnosis easy.

Literature of '96-'97-'98.

Primary muscular dystrophy in two brothers. The parents were healthy. In both cases there was slow onset in childhood; atrophy affecting the shoulder-girdle, upper arms, and thigh. Theodore Diller (*Med. Rec.*, Nov. 7, '96).

Pathology.—The disease is, according to Erb, a primary myopathy, the cord and motor nerves showing, as a rule, no alteration. Rarely morbid changes in the cells of the ventral horns have been observed, but these may not have been connected with the myopathy. The muscular fibres simultaneously show various stages of morbidity, some being atrophied, others hypertrophied. Fat may be present in the interstitial connective tissue and constitute the pseudohypertrophy alluded to. The first changes, however, usually consist in true hypertrophy of the muscular fibres, followed by fissure and increase of nuclei, while the connective tissue becomes greatly increased in the perimysium internum. The stage of atrophy follows and progresses steadily.

Case of progressive muscular dystrophy, in which there was found fatty areas in the middle of two degenerated muscular sheaths: a fact not hitherto observed. Münzer (*Allg. med. cent. Zeit.*, Aug. 26, '93).

Literature of '96-'97-'98.

Case representing a form of precocious amyotrophy of rapid course with predominating symptoms in the lower limbs, and belonging, therefore, to the disease called by Hoffman "progressive spinal amyotrophy of early infancy." The affection is characterized by the rapid atrophy of the muscles, the presence of adipose tissue, and a secondary lordosis with muscular retraction. Fibrillary twitchings may or may not be

present. Pathologically there is simple atrophy of the muscles, and degeneration or disappearance of the cells of the anterior cornua of the spinal cord and of the anterior roots. The prognosis is unfavorable, death usually occurring not later than the sixth year. There are numerous transitional forms of the disease. P. Haushalter (*Revue de Méd.*, June 10, '98).

Histories of 20 cases collected from records of the Philadelphia Orthopædic Hospital and Infirmary for Nervous Diseases. Most of the patients presented the form known as pseudohypertrophy. Four of the patients were of the female sex; all were white. Attention is called to the rarity of dystrophies in pure blacks. In 11 of the cases infectious diseases had preceded the onset of the dystrophy. In only 2 cases did similar disease exist in another member of the same family. As to the pathogenesis of the disease, nothing is known. The hypothesis is suggested, however, that the disease may be connected in some way with the thymus gland, as its commencement usually falls in the period during which the thymus is normally most active, and the use of thymus extract is proposed in the treatment of the dystrophies. A. A. Eshner (*Amer. Jour. Med. Sci.*, Sept., '98).

Treatment.—Muscular exercise is thought by Gowers to stay the progress of the disease. Electricity and massage carried out assiduously have also been recommended, but no treatment has so far brought about complete recovery. The general health should receive the greatest attention, tonics, nutritious food, fresh air, etc., by increasing the vigor of the organism, tend to delay the progress of the degenerative process. When the patient is bedridden, care should be taken that the contractures do not cause flexion of limbs in awkward positions.

Progressive Muscular Atrophy of Central Origin.

This is a progressive atrophy of the muscles, combined with more or less

marked rigidity, usually beginning in the hands, and due to chronic degeneration of the spinal motor tract. (See SPINAL CORD.)

Progressive Neural Muscular Atrophy.

This is a progressive atrophy observed in children in which the muscles of the feet and the peroneal group are usually first affected, as the result of chronic interstitial neuritis. (See PERIPHERAL NERVES.)

Infectious Myositis.

The various forms of muscular inflammation due to rheumatism, gonorrhœa, pyæmia, and other infectious disorders, etc., are reviewed under the heads of the causative affections. This article only includes, therefore, the form of myositis which occurs as the result of infection.

Symptoms.—Slight fever and enlargement of the spleen are often noted early in the history of myositis. Swelling, stiffness, and tenderness of the muscles, slight œdema of the hand or foot, according to the extremity first involved, tension of the skin over the affected part, represent about all the earlier symptoms observed in all cases. Apart from these, the symptomatology varies according to the causative affection. In some there are disorders of sensation greatly suggesting a kinship with peripheral neuroses; others so simulate progressive muscular atrophy that a diagnosis is quite difficult. Again, trichinosis is suggested by many of the local and general manifestations, and the diagnosis cannot be established without a microscopical examination involving the removal of a small section of the affected muscle. Diffuse purulent infiltration sometimes follows the local inflammatory process, reaching in some cases to gangrene. An erythematous rash is sometimes observed. As the disease progresses the use of the member affected becomes increasingly

impaired, locomotion being quite difficult and painful when the muscles of the legs are the seat of disorder. The œdema is first limited to the extremities, invades the trunk, then the face, giving the latter a bloated appearance suggesting myxœdema. The muscles of deglutition, mastication, and respiration being occasionally involved, the general nutrition greatly suffers, while dyspnoea may become distressing. Inflammatory disorders of the respiratory tract sometimes occur concurrently, pneumonia, even, having been observed as a terminal complication. The affection usually lasts between three and four months, though chronic cases may last much longer.

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Symptom so far unrecognized, namely: an effusion into the cellular tissue over the muscles after the myositis has subsided somewhat. This effusion is not great, but it gives rise to an audible crackling that can be elicited by moving the skin over the affected muscle. One may find this especially well marked in cases of intercostal rheumatism. A. G. Miller (*Scottish Med. and Surg. Jour.*, Sept., '98).

Etiology and Pathology.—The evidence at hand tends to show that an infectious principle, the nature of which is still unknown, is the direct pathogenic agent. Marked proliferation of the interstitial tissue, fatty degeneration, or hyaline degeneration of the muscular fasciculi have been noted microscopically (Hueppe).

Six personal observations on diffuse interstitial syphilitic myositis. A muscular atrophy analogous to progressive muscular atrophy found with the addition of vascular sclerosis and the formation of connective tissue. Antisyphilitic treatment is always effectual in these forms. Lewin (*Oesterr.-ungar. Centralb. f. d. med. Wissen.*, May 7, '92).

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Three cases of myositis occurring in the second and third weeks of scarlatina after the subsidence of acute symptoms. This complication is unaccompanied by fever, and disappears rapidly, as a rule. It can hardly be distinguished from ordinary muscular rheumatism. Bruck (*Gaz. degli Osped.*, July 7, '98).

Treatment.—In a study of eleven cases Cayet found that the most satisfactory treatment consists in leeches or other antiphlogistic measures at first, and mercurial or iodide-of-lead ointments later on. The use of electricity did not seem to be particularly indicated, but systematic massage is very valuable. Care must be taken, however, to alternate it with sufficient intervals of muscular rest. The cure is best completed by means of graduated exercises and passive movements.

Polymyositis.

Polymyositis is a condition in which there is a simultaneous inflammation of many muscles and of some nerves, the inflammation being symmetrical in its distribution. (Gowers.)

Symptoms.—The affection presents the general distribution of polyneuritis so far as preponderant loss of power is concerned, but with a far wider implication of the muscles, of which many suffer that escape in ordinary polyneuritis. At first they are very tender, and later they undergo hardening and contraction, which may be extreme in degree, and after a time may be insuperable and resist all efforts to overcome it.

The cardinal symptoms are swelling of the extremities, partly from muscular swelling and partly from subcutaneous œdema, affection of the muscles of respiration and deglutition, with disturbances of their functions and an exanthem. Moderate fever, profuse sweats,

splenic tumor, with death from inhalation-pneumonia or from suffocation, are common.

The muscles of the eye, tongue, and diaphragm are not involved. Case of a pregnant woman, where the skin affection, resembling urticaria, was much more marked than the affection of the muscles. The patient recovered. Unverricht (*St. Petersburger med. Woch.*, Oct. 6, '90).

Etiology.—The condition is almost exclusively the result of exposure to cold, and seems to be due to a peculiar variety of the rheumatic poison produced in especially susceptible individuals, rendered so by some influence that depresses the general health (Gowers). A vegetable parasite, a toxin, and an animal parasite (gregarina) have been variously considered as pathogenic factors. Syphilis gives rise to a condition resembling acute myositis.

Case of polymyositis brought on by muscular overwork. Oddo (*Marseille-méd.*, Dec. 15, '91).

Two cases, one occurring in a diabetic in whom evolution took place in fourteen days, terminating in death, and the other in a healthy man, following the eating of shrimps, and cured in two months. In the first intense interstitial myositis found, with proliferation of the nuclei between the fibres, particularly in the perifascicular and perivascular connective tissue. The intrafibrillary tissue was œdematous. Senator (*Deut. med. Woch.*, Sept. 28, '94).

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Case presumably of syphilitic origin. The patellar reflexes were exaggerated. On incision into the left gastrocnemius a light brownish-red fluid escaped containing fragments of old blood-clots. Bacteriological examination of this fluid and of the excised muscle were negative. The excised muscle exhibited the diffuse inflammatory change, with hyaline degeneration. James Herrick (*Amer. Jour. of Med. Sci.*, Apr., '96).

Case in a married woman aged 36. The symptoms indicated that polyneuritis, as well as polymyositis, was present. W. R. Gowers (Brit. Med. Jour., Jan. 14, '99).

TREATMENT.—The only hopeful treatment of this condition consists in well-directed measures applied during the stage of development.

Iodide of potassium, strychnine, and electricity seem indicated in these cases besides the symptomatic treatment usually recommended.

Muscular Hypertrophy.

True hypertrophy of the muscles differs from pseudomuscular hypertrophy in that it is attended by fewer disturb-

between the muscular fibres, occurring as a result of inflammation. Fulda considers it as a trophoneurosis resulting in a true hypertrophy.

TREATMENT.—Treatment by electricity is valuable in these conditions, possibly along with a course of the iodides. The faradic current should be used five minutes every day and massage employed.

Progressive Ossifying Myositis.

Definition.—This consists of an inflammatory affection of certain muscular tissues, resulting in a deposit of bony material in the course of the muscle, displacing its substance and finally leading to ankylosis of the affected part.



Myositis ossificans. (Stonham.)

(London Lancet.)

ances of nerve-function and that it may sometimes be arrested by the application of the galvanic current. It may be preceded by pain in the muscles only or may occur as a sequel to infectious fevers: typhoid, influenza, etc. As a rule, many muscles enlarge simultaneously. In a case witnessed by Fulda the majority of the muscles were hypertrophied, and deglutition was rendered very difficult. None of the muscles of the body showed any trace of atrophy in a case studied by Pal.

ETIOLOGY.—The nature and causes of this affection are obscure. Lesage considered it as due to a deposition of fat

Symptoms.—Slight fever, redness of the skin over the muscles of the neck and back, and swelling of the latter constitute the first manifestations usually noted. After some time, a period of apparent improvement, the muscles become increasingly harder to the touch: the first indications of the ossifying process, which progresses very slowly. The calcification is such sometimes as to transform the majority of the muscles into bone-like masses of extreme hardness. The total loss of contractility thus engendered naturally gives rise to pseudoankylosis, the subject being reduced, as regards motion, to the condition of stone:

the "ossified man" of museums. Only forty cases have been recorded so far.

The disease seems to attack children or adolescents, and is not steadily progressive, but comes on in fits and starts, each attack being associated with considerable pain and the appearance of a swelling in the substance of some muscle, which diminishes in size after a time, but leaves behind it a tumor of bony consistency. During the attack there is some fever, and possibly also local glandular enlargement.

Case of generalized myositis ossificans, which began at the age of 19, involving at first the whole of the right side. Tumefactions occurred in the regions of the muscles attacked. In the spring of every year the swelling extended to the left side. Considered as an affection of the bones secondarily involving the muscles. Virchow (Berl. klin. Woch., Aug. 6, '94).

Death frequently occurs as the result of pulmonary disorders or of suppuration with septic absorption.

Etiology.—Local injury giving rise to myositis is thought to be the primary factor in many cases, especially when the subject presents a congenital predisposition to the formation of bone in inflamed parts. It is closely allied to rheumatism, and is sometimes found in subjects showing congenital malformations, especially hallux valgus and microdactylia (Stonham).

Case of progressive ossifying myositis observed in a girl of 4 years. The left sterno-cleido-mastoideus had undergone osseous transformation and was removed, but soon afterward new osseous deposits formed. Studsgaard (Satellite of the Annual, Mar., '92).

Case of myositis ossificans in a boy 9 years old. The bones were, for the most part, hypertrophied and irregularly formed. The case showed an association with hallux valgus and microdactylia. Weldon Carter (Lancet, Feb. 10, '94).

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Study of a bony growth which had been removed from the deltoid. To the naked eye the tumor looked like a fibroma, although there were scattered through it several reddish areas due to a persistence of normal muscular fibres. Microscopically it was found that there was an abundant infiltration of the connective tissues with round cells, while here and there cartilaginous nodules appeared, and throughout the newly-formed tissue bony material was deposited; the muscular substance proper was simply atrophied, and in no way involved actively in the process. Lexer (Langenbeck's Arch., B. 50, H. 1, '97).

Treatment.—Nothing yet employed has seemed to arrest the process of ossification.

Myasthenia Pseudoparalytica.

Myasthenia pseudoparalytica is a disease characterized by exacerbations of extreme exhaustion of certain muscles and involving, among others, those of respiration and deglutition.

Symptoms.—The onset is usually acute. The muscles of the face, those of deglutition, and the external eye-muscles are often the first affected, the least continued effort in which these are utilized being followed by their complete exhaustion and paresis. Strabismus, when the eye-muscles are involved, great difficulty in deglutition, etc., may thus occur suddenly. The same exhaustion occurs after repeated electrical stimulation (Golly). After a period of rest the muscles gradually recover some of their tone and their functions are resumed. In some cases persistent paralysis ensues. Myasthenia sometimes proves fatal.

Pathology.—Myasthenia is thought to be a form of bulbar paralysis, the organic lesions affecting particularly the lower motor neurons. This view is hypothetical, however, and is based mainly upon isolated symptoms observed in other dis-

orders, no clearly-defined local morbid changes having so far been discerned.

Treatment.—But few cases of myasthenia have so far been reported and no special therapeutic measures have been proposed.

Myotonia Congenita (Thomsen's Disease).

A disorder in which certain groups of muscles, when voluntarily contracted, remain in a state of tonic cramp a short time, then gradually become relaxed.

Symptoms.—When a patient suffering from myotonia grasps an object, the hand closes normally around the latter, but the grasp persists, notwithstanding his effort to open his hand. The cramp may be of brief duration and the patient almost immediately begin to straighten his fingers, or it may last some time, especially when the extremity is used after a period of rest. Continued use improves the muscular movements, and if the object is seized and dropped several times in succession the operation becomes sometimes normal. The same phenomena may appear when the patient starts to walk: one leg being put forward slowly, it remains stiffly in the extended position a couple of seconds, when it can be used as a resting-point for the trunk by the use of the extensors, while the other leg is advanced. After a few steps have been taken but little difficulty is experienced. Sudden use of the lower limbs after a period of rest may thus become a source of danger, the patient falling heavily, owing to sudden cramp of the muscles upon which he depends for the maintenance of the erect position. Excitement, cold, and overuse also predispose the muscles to tonic cramp.

The muscles of the arms and legs are usually the only ones affected. The muscles of deglutition, the sphincters, and the non-striated muscles are never in-

volved; the facial, laryngeal, or ocular rarely. In a case reported by Ballet and Marie the eyes became fixed when turned upward and their position could only be altered gradually. The patients are usually strong, though not in proportion to the muscular development, which is often unusual. Distinct hypertrophy is sometimes observed. The disease gives rise to little physical suffering, but mental torpor and a tendency to melancholia have been observed in a small proportion of cases. Erb has called attention to the fact that the electrical reactions of the muscles were characteristic: their mechanical irritation is increased, but, instead of contracting suddenly, they only do so slowly, the act being followed by a prolonged tonic after-contraction. While the constant galvanic current is being used it gives rise to rhythmical wave-like contractions of the body of the muscle, the "flow" going from cathode to anode.

The affection, which begins early in life, usually continues uninterruptedly until death from an intercurrent disorder. Some cases, however, are attended by exacerbations and remissions; in a very small proportion of cases the improvement is permanent.

Etiology.—Myotonia is hereditary in the majority of cases. While other forms of spasm simulate it, the typical disease has always occurred in family groups. In the family of Dr. Thomsen, who first described the disease and who was himself a sufferer, myotonia was traced through five generations. Fright and overuse of the muscles seem to act as predisposing factors. It is more frequently observed in males than females. The disease is rarely observed in the United States.

The initial lesion is muscular hyperplasia. Hypertrophy is found mostly in

those muscles which perform the greatest amount of work; it is of functional origin, with integrity of the nervous system. Déjerine and Sottas (Le Bull. Méd., June 5, '95).

Case of a man in whose family Thomsen's disease, as usual, was hereditary. The first symptoms showed themselves at the age of 6 years and were present at the onset in winter only, the patient being in good health during the summer. O. Hollmann (Schmidt's Jahrb., Jan., '95).

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Case of Thomsen's disease in a patient 28 years old, and who had not been affected by the trouble until he was 18 years of age; hence there is no propriety in calling such a case "myotonia congenita." Cases divided into three classes as follows: (1) myotonia congenita, (2) myotonia acquisita, and (3) myotonia transitoria. G. W. Jacoby (Med. News, Jan. 1, '98).

Pathology.—The exact pathology of myotonia may be said to be unknown. Hypertrophy of the muscle-fibres—some being double the normal size—with a multiplication of nuclei affecting the entire muscular system, except the myocardium, were observed by Déjerine and Sottas. The peripheral nerves and the spinal cord showed no morbid change.

Treatment.—Gymnastics or systematic stimulation of the muscles by co-ordinated exercises, frictions with oil, and massage may be tried with some hope of mitigating the intensity of the manifestations. Marriage proved of great value in the case of a young female.

CHARLES W. BURR,
Philadelphia.

MUSCLES, SURGICAL DISEASES OF.

Strain and Rupture.

What is usually termed a "sprain" signifies an undue stretching of the muscular fibres or their tendinous extrem-

ities. It may vary in severity from a slight overextension to absolute rupture. The rupture in severe cases may be partial or complete, the latter being more likely to occur in long-bellied muscles. Rupture of the fibres is often attended by an audible snap, and gives rise to instant pain, which may become excruciating in severe injuries,—the *coup de fouet* of French authors; the patient finds it impossible to perform movements involving the use of the injured muscle. If the tear be marked and near the surface a gap in the tissues may sometimes be felt, corresponding to the ecchymosis, or fluctuating extravasation of blood, of which the injured region is the seat. When the rupture occurs at the knee, marked effusion of the joint soon follows, as in rupture of the quadriceps tendon at its insertion into the patella. When an abdominal muscle is the seat of rupture a ventral hernia may be developed.

Etiology.—Subcutaneous rupture only occurs when the muscle is submitted to the disintegrating action of great force, or when, through the influence of age or infectious general diseases (particularly rheumatoid arthritis, typhoid fever, etc.), the muscular and fibrous tissues have undergone some process of degeneration. Under such circumstances spontaneous rupture may occur under the influence of slight muscular exertion,—indeed, without any violence, sometimes, through the muscles' own contractile force. Thus, the rectus abdominis may be ruptured during labor merely through its own contractions. Tendons, especially the tendo Achillis, often give way when persons of advanced age jump or dance.

Treatment.—Moderately severe injuries tend to recover without complications under appropriate measures. The torn ends should, as much as possible, be held in apposition by immobilizing the

part in a position wherein the injured muscle or tendon is completely relaxed. New tissue is developed between the separated ends. At first the new tissues are adherent to adjoining structures, but the adhesions are gradually stretched and absorbed when the patient resumes the use of the muscle. Rupture of the tendo Achillis, for instance, is best treated by immobilizing the leg in the fixed position; a collar around the thigh serves for the attachment of a cord the other end of which is attached to the heel of a soft slipper; rupture of a thigh-muscle, on the contrary, requires full extension of the limb in a splint, etc. The parts should be given absolute rest by the avoidance of all motion, and *slight* compression should be exercised upon them by means of a bandage. When the rupture occurs in a healthy muscle, it may sometimes be necessary, to hasten the recovery or to prevent a long sojourn in bed (a dangerous practice in aged subjects), to expose the parts under strict antiseptic precautions, uniting the separated ends by sutures.

Hernia of Muscle.—Sometimes the fascia, or sheath overlying the muscle, fails to heal, and a portion of the muscle protrudes. During its contraction this becomes especially marked, and an elastic, fluctuating tumor is formed. The muscles of the thigh and abdomen are most prone to this condition, especially if overexertion too soon after the injury is not avoided. Healed fascia under these circumstances may also be torn anew.

Muscular hernia may readily be recognized by the fact that it disappears or becomes prominent according to the proximity of the contraction imposed upon the muscle by motion.

TREATMENT.—Rest and well-adjusted pressure with a hernial bandage are usu-

ally sufficient in recent cases. When much discomfort is caused, or the hernia is an old one, the skin should be incised and the edges of the torn fascia be freshened and united with catgut sutures.

Ossification.

Localized strains, when repeated, sometimes give rise to local inflammation, culminating in ossification of a part of the muscle. The "rider's bone" is an instance of this complication which is occasionally observed in persons who do rough horseback-riding. The process of ossification takes place in the adductor longus here, but it may occur in any muscle submitted to undue mechanical action. When located in a superficial muscle the "bone" may usually be detected by pressure, but when deep seated it is not recognized during life. Ossification may also be due to syphilis. (See also MYOSITIS OSSIFICANS under MUSCLES, DISEASES OF.)

TREATMENT.—The bony growth does not occasion serious discomfort in the majority of cases, but at times it gives rise not only to local pains, but also to impairment of the functions of the affected muscle. It should then be removed surgically, all milder methods being futile.

Muscular Dislocation.

Dislocation of muscles and tendons are occasionally observed, when laceration of the fascia, synovial sheaths and violence concur to cause them to slip over the bony prominence. Dislocation of the peronei muscles over the external malleolus may thus occur during severe wrenches or sprains. The long tendon of the biceps may also be displaced from its groove. The extensor tendons of the wrist are especially prone to this difficulty. Considerable pain and inability to use the affected limb are at once experienced, and the use of the limb is

more or less compromised until reduction is effected.

TREATMENT.—In recent cases reduction of the displaced structure is easily effected by relaxing the muscle and manipulating the member according to the nature and direction of the dislocation. Thus, in dislocation of the peronei, rotating the foot outward is indicated; a retentive bandage is then applied and kept until complete recovery is obtained. When the tendon will not remain *in situ*, the groove in which it lies may be deepened by exposing the bone and gouging it subperiosteally, as recommended by Albert.

Wounds of Muscles.

Subcutaneous, incised, or lacerated wounds of muscles are frequently met with, especially the latter. Under modern asepsis, unless the loss of tissue be very great or the supply of arteries and nerves be seriously injured (when gangrene is apt to occur), resolution usually occurs promptly in small wounds through regeneration of muscular tissue, and in extensive ones through cicatricial connective-tissue formation. The functions of the injured muscle are often restored under circumstances that would seem to preclude all hope.

TREATMENT.—In lacerated, contused, and incised wounds of any severity, the torn edges, if any are present, should be trimmed off, then united with catgut: buried sutures. Under aseptic precautions this procures early recovery and the minimum of deformity. In mild injuries close apposition by strapping and rest are usually sufficient.

Muscular Atrophy of Traumatic Origin.

Wasting of a muscle may be of trophic origin through disuse, but also through involvement in injuries of some of the channels through which the nutrition oc-

curs, compression, laceration, etc. Atrophy may thus follow fractures as a result of inactivity, but in the majority of cases reflex disturbance of the trophic nerves is the main cause of the wasting. A fractured limb often affords indications that the nutrition of the limb is impaired, the preliminary factor in atrophy, and simultaneously a warning that its development should be prevented by local warmth, gentle massage, etc.: *i.e.*, measures calculated to sustain the vitality of the limb while it is immobilized. Pressure upon the blood-vessels may also act as a predisposing factor through malposition of the limb or the constriction of a bandage. The importance of avoiding prolonged sojourns in bed, in the case of aged patients, is obvious.

Nerve-injuries, diseases of the joints, diseases of the spinal column, etc., also act as causes of muscular atrophy by interfering with the nutrition of muscles either directly or through reflex influence bearing mainly upon the vascular supply. (See also MUSCLES, DISEASES OF.)

TREATMENT.—When the limb merely becomes thin through disuse while in a splint, light massage, if normal resolution does not soon follow its release, soon causes rapid improvement. *Effleurage*—*i.e.*, strokes directed toward the trunk (to activate the circulation) made with the palm of the hand or its radial border—is indicated at first; subsequently, when the limb has become stronger, *pétrissage*—*i.e.*, seizing the tissues with both hands and raising them (as a cat is lifted by the neck) repeatedly, followed by kneading of the parts thus raised—should be resorted to. Strychnine should also be administered internally.

In atrophy due to lesions of nerves, bones, etc., the cause should first receive attention.

Traumatic Myalgia.

Muscular pain, rendering the use of the muscle involved more or less difficult, is a frequent result of overuse, especially when the sufferer is not accustomed to arduous labor. Bicycle-riding, horseback-riding, trunk-packing, etc., thus often became a cause of myalgia, the result of fatigue. After two or three days' rest the tissues recover their normal *status*. Severe myalgia is often caused by strain, twisting, blows, falls, compression, etc. All these factors are most active in causing myalgia in persons subject to rheumatism. (See RHEUMATISM, MUSCULAR.)

TREATMENT.—Heat, light massage, and electricity are valuable remedial means. Compresses of warm or cold water, or a mustard poultice placed some distance away from the sensitive spot hasten resolution when spontaneous subsidence is not prompt.

MYOSITIS. See MUSCLES, DISEASES OF.

MUSCULAR ATROPHY. See MUSCLES, DISEASES OF.

Contracture.

Permanent fixation of a muscle in the contracted state may be caused by a large number of factors: inflammation of local or remote tissues, traumatic, diathetic, or toxic agencies, etc. Hemiplegia, for instance, is often complicated with contracture of all the muscles of the upper extremity. The arm is usually held against the body, the hand being flexed upon the forearm and the latter upon the arm: a general contracture of the flexors. In some cases the forearm is merely flexed upon the arm, the latter being free at the shoulder. When this variety occurs in a young woman, hysteria is to be suspected. Contracture of this character may also be due to rheumatism or syphilis, the biceps being the seat of an exacerbation of either disease. Permanent

contracture often follows severe traumatism when appropriate curative measures are not immediately instituted. Burns involving the deep cellular tissue and attended by much destruction are also apt to be followed by cicatricial contracture when the region of the elbow or the palmar tissues are involved. Chronic inflammation of a muscle, descending neuritis, persistent irritation along some portion of the motor tract, or prolonged disuse of a muscle if it remain in a given position, weakened action of an antagonistic muscle whether of central or peripheral origin, contiguous bone or joint disease, tumors pressing upon a given set of muscles or its nervous supply are all capable of giving rise to contracture.

The lower extremities are also susceptible to the same influences. Besides the disorders that enter the field of neurology, spasmodic rigidity, and other conditions which sometimes require tenotomy or myotomy, we occasionally witness contraction of the muscles of the thigh occurring as a result of dislocation or hip disease.

Diagnosis.—Contracture—*i.e.*, permanent shortening of muscles—must be differentiated from temporary rigidity, such as is witnessed in the early stage of inflammation of a joint and in hysteria. The fact that in these disorders the muscles relax under an anæsthetic, whereas in permanent contractures they do not, affords an easy and certain way of determining this question. The history of the case usually facilitates the recognition of the origin of the trouble in individual cases. Non-traumatic cases are usually the result of cerebral or spinal lesions, and, in children, of infantile paralysis, owing to the reduced resistance of affected muscles. Spinal inflammatory disorders are usually attended by marked flexion at the hip and knee. As already

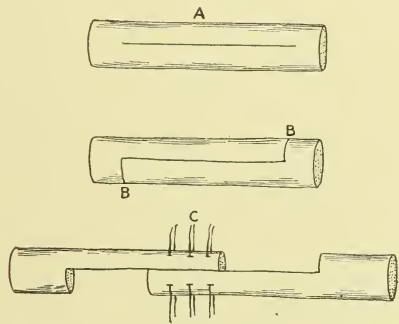
stated, contracture of the biceps is usually of syphilitic or rheumatic origin; the same may be said of the corresponding leg-muscles.

Treatment.—The factors leading to contracture are so numerous and the forms which it assumes are so varied that each case must be treated on its own merits. In some, remedies calculated to antagonize a diathetic disorder are of primary importance. In rheumatic and in syphilitic contraction of the biceps, for instance, a course of iodide of potassium is of primary importance to antagonize the fundamental cause of the disorder and prevent recurrence after tenotomy: the second phase of the curative measures indicated. The biceps being the contracted muscle, its tendon is easily cut by passing a tenotome flatwise beneath it from within outward (thus avoiding the artery) and cutting upward by a gentle sawing motion. The wound being closed, the arm is fastened into a straight splint, in extension, and left there until resolution of the cut parts has sufficiently occurred to warrant passive motion.

Lengthening of tendons to overcome contracture has been performed by Anderson, Keen, and other surgeons in the manner indicated in the annexed cut. The tendon being exposed, it is split longitudinally with a thin knife (*A*); each end of the cut is then continued at right angles in opposite directions (*BB*). The tendon being thus severed, its ends are superposed as shown (*C*) and united by means of three catgut sutures. The wound is then closed. Properly performed, this operation procures excellent results. The longer are the united surfaces, the greater are the chances of a successful issue.

When, as a result of operative procedures, the normal action of the mus-

cle cannot be obtained, notwithstanding additional measures such as massage, electricity, friction, etc., and the internal administration of strychnine, it can be supplemented by the use of India-rubber bands (Sayre's rubber muscles) or springs, connected with suitably-shaped collars, which are fastened around the limb: one about where the paralyzed muscle arises and the other where it is inserted. They are usually of most service in paralysis of the leg-muscles. Simple paresis of the latter through disuse may be overcome by measures calculated to enhance their nutrition,—massage, electricity, etc.,—coupled with motion.



Anderson's operation for lengthening a tendon.

Conclusions in relation to paralytic deformities: 1. Prevention of deformities by means of apparatus and other measures is exceedingly important. 2. When contractions have occurred the employment of surgical measures should, as a rule, precede the application of mechanical appliances. 3. Myotomy and tenotomy, either subcutaneous or open, are perfectly safe operations. 4. In contractures at the hip free open incision is usually preferable; at the knee subcutaneous section can frequently be performed, but when fascial contractions occur in the central popliteal space open incision is necessary and excision is occasionally demanded. At the foot subcutaneous division usually is sufficient;

tarsectomy is seldom necessary. Fasciotomy is frequently required. 5. Forcible straightening following division is important. Rectification should be complete at the time of operation and all contracted tissues should be divided. 6. In spastic paralysis lengthening the tendons by tenotomy assists in restoring muscular equilibrium, and, consequently, secures better subsequent locomotion. 7. Free section of the adductors is often advisable. 8. The best subsequent dressing for maintaining abduction while the patient is in bed is the application of a rigid dressing to the knees. The legs can then be fastened widely apart. 9. Mechanical appliances with lock- or stop-joints are important, and artificial support by wheeled crutch or other measures will assist in restoring muscular power. De Forest Willard (*Archives of Ped.*, Sept., '94).

[In certain cases of paralysis transplantation of muscles is of service. Thus, the peronei tendons may be detached from their insertion and sewn to the tendo Achillis in paralysis of the muscles of the calf of the leg. G. G. DAVIS.]

Torticollis (Wryneck).

Torticollis is the name applied to an abnormal position of the head produced by contraction of the muscles on one side of the neck. The head is drawn downward on the affected side and rotated to the opposite side. If, therefore, the left side of the neck is affected the face is turned toward the right on a vertical axis and likewise somewhat rotated on a horizontal axis.

Torticollis usually occurs in childhood and is sometimes congenital. In the congenital form it has been ascribed to intra-uterine disease or injury, such as pressure, but it is undoubtedly, sometimes, the result of injury to the muscles of the neck, particularly the sterno-mastoid, at the time of birth. In acquired cases cold or rheumatism acts at times as a cause; also affections of the throat, inflammation of the glands, and contrac-

tions from burns. Paralysis of the muscles of one side and even bad eyesight, as extreme myopia causing monocular vision, may result in holding the head in a more or less permanently incorrect position.

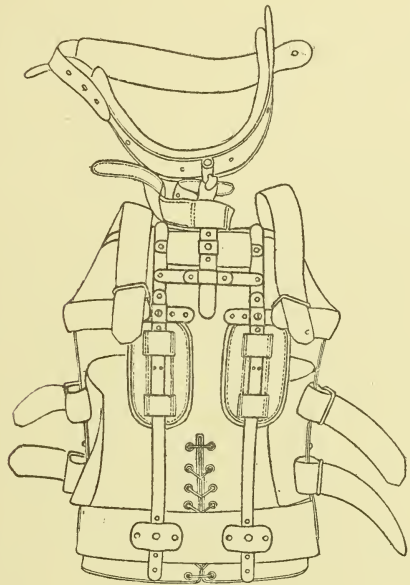
A form exists in adults called SPASMODIC TORTICOLLIS from the fact that the neck is the seat of oft-recurring spasms which twist the head to one side in a very distressing manner. The cause of this form probably lies, in a considerable proportion of cases, in some disease of the central nervous system. The sterno-mastoid muscle is not apt to be the only muscle involved, the trapezius, splenius, and others being likewise sometimes affected.

Diagnosis.—Care should be taken not to overestimate the gravity of the affection. Thus, particularly in children, inflammation of the glands of the neck, tonsils, rheumatism, cervical caries, and mental or ocular affections may cause the head to be held in the position of that of true torticollis, but these cases, as a rule, do not demand operation; so that radical procedures are only to be decided on after careful exclusion of temporary causes.

Treatment.—When the affection is suspected to be temporary, treatment should be directed first to the relief of any discoverable cause. Locally, hot, moist applications: cloths wrung out of hot water or even persistent poulticing may be tried. These are to be followed by gentle massage frequently repeated. Internally, antirheumatic remedies should be given if that disease is suspected. If any local support is desired a simple one may be made of pasteboard molded to the part, padded, and bound on with adhesive straps or a bandage. If the disease is of a chronic, persistent kind, tenotomy of the sternal, and if that is not sufficient

also the clavicular, origin of the sterno-mastoid muscle should be resorted to. For this purpose an anæsthetic should be given and the tendons and any neighboring contracted bands of fascia should be divided through an open incision. Of course, the strictest antiseptic precautions should be used. It is not worth while to attempt a subcutaneous operation, as the division of all the retaining bands will not be so complete, and even in the hands of an experienced surgeon wounding of the large vessels is liable to occur. The wound having been sutured and dressed, the head is to be placed in as much an overcorrected position as possible, and kept there at least until the wound is soundly healed. One way of accomplishing this is to fix the head in the desired position by means of a plaster-of-Paris dressing, which is wound many times around the head, neck, and upper part of the chest. While the plaster is still soft the head is twisted to the desired position and held there until the plaster sets. Another means is to use an apparatus consisting of a vertical bar going down the back of the neck and fastened to a light chest-jacket. The upper end of the bar carries a cross-piece which winds around the occiput and ends above the ears. From the ends above the ears one strap goes across the forehead and another from side to side under the chin. By means of wrenches the back-bar can be bent either around on its axis or else backward or forward, and thus be adapted to the special case. A third way is to surround the head with a properly-fitting band either of metal or leather. From this goes down an elastic band to be fastened to another band of adhesive plaster on the side of the chest. Either one of these three ways can be used, although sometimes one will seem to suit the particular case better than the others.

In SPASMODIC TORTICOLLIS antispasmodic remedies—such as tincture of *cannabis Indica*—may be given, beginning with 5 drops, three times daily and gradually increasing—the case being carefully watched—until a drachm is being taken. Other remedies—such as large doses of strychnine, hyoscyamus, and the coal-tar products—may also be tried. If these fail, the spinal accessory nerve may be resected just as it enters the sterno-mastoid



Torticollis apparatus. (*G. G. Davis.*)

muscle. Attempts have also been made to divide the posterior branches of the cervical nerves also. The operation, while in some cases followed by improvement, is very apt to fail in giving much relief and the disease returns, though perhaps at times in not quite so violent form as previously.

(See also TENDONS, FASCIA, AND BURSÆ, DISEASES OF, and ORTHOPÆDIC SURGERY.)

GWILYM G. DAVIS,

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MUSHROOM POISONING. See TOXIC FOODS.

MUSK.—Musk is a secretion of follicles contained in a sac extending from the umbilicus to the prepuce of the musk-deer of Thibet and other regions of India. It is very doubtful whether much of the musk on our markets is pure, although the Siberian musk is thought to represent the genuine substance. This should be unctuous, soft, and reddish-brown. Its odor is most penetrating, causing nausea in many individuals, and even more active symptoms—headache and spasm—in sensitive subjects. It is soluble in equal parts of water and in nine parts of alcohol.

Preparations and Dose.—There is a tincture of musk (U. S. P.) of which the dose is 30 minims to 1 drachm; but pure musk, the dose of which is 5 to 10 grains, given in pill or emulsion, is usually preferred.

Physiological Action.—Musk seems to possess a peculiar action in the relief of collapse and general vital depression. How this effect is produced is hardly explained by the data at hand concerning its physiological properties, these being based upon contradictory results in almost every particular. Jorg found it to cause exhilaration without depression. Sundelin found that it could cause depression, vertigo, and drowsiness. H. C. Wood, basing his opinion upon clinical experience, thinks its action depends upon an equalization of the disturbed balance of nervous power.

Therapeutics.—Musk is a valuable stimulant and antispasmodic, especially where trismus or other spasmodic conditions complicate acute febrile disorders. When the strength of the patient is failing and this becomes manifest not only by general evidences, but by special

symptoms,—convulsions, singultus tendinum, muttering delirium, etc.,—rectal injections of musk, 10 grains to a pint of starch-water, has been highly recommended. It allays the symptoms and stimulates respiration, strengthens the cardiac and the general circulation, and seems to benefit every untoward feature of the case. In pneumonia it was often employed by Trousseau, and helps to sustain the patient through the critical period.

In all spasmodic disorders—laryngismus stridulus, in the annoying and persistent spasmodic cough following pertussis—it has shown considerable power.

Musk has been recommended in many general disorders, rheumatism, gout, etc., but the claims for it have not been sustained by clinical evidence.

MUSTARD.—Mustard, as employed in medicine, is the flour of the mixed seeds of white mustard (*Sinapis alba*) and black mustard (*Sinapis nigra*). Their property mainly depends upon a volatile oil which is developed when, after the two varieties are mixed, the flour is moistened with water at ordinary temperature.

Therapeutics.—As an emetic, mustard, a tablespoonful in a glass of water, is often used when, as in cases of poisoning, rapid emesis is required.

As a rubefacient and counter-irritant, mustard is probably used more than any other agent. It should not be employed pure, as found in households, but mixed with flour or some other inert substance to limit its irritating action—which becomes destructive if the pure mustard is left on the skin too long. One part of mustard (English) to 4 of flour for adults, and 1 to 6 for children and women with delicate skins generally prove sufficiently irritating. The mixture should be spread

evenly between two layers of muslin. Mustard-paper (U. S. P.) is a convenient substitute, but it is too strong for children. Mustard burns or irritation are slow to heal. Lime-water and olive-oil, equal parts, hasten resolution.

Mustard may be used as a styptic for almost any disorder in which pain is a prominent factor. In headaches of all kinds a mustard poultice applied to the nape of the neck is very efficacious. In gastric disorders, when applied over the organ, just below the end of the sternum, it is very helpful. In nausea it is prompt and effective.

Mustard foot-baths are very useful in the incipient stages of almost all disorders, while mustard sitz-baths are helpful in delayed menstruation. The latter, however, should not be made strong, the delicate mucous membrane of the vulva being easily irritated.

DISORDERS OF THE RESPIRATORY TRACT.—Troublesome cough—as shown by Gorodtsoff, who employed it satisfactorily in a large number of cases—is greatly benefited by mustard. The disease comprised epidemic influenza, croupous pneumonia, exudative pleurisy, pulmonary tuberculosis, and acute bronchitis. In adults the mustard was mixed with an equal amount of wheat or other meal; in the case of children the combination was 1 part to 3 of the meal. Plasters were placed on the chest and the back, alternately, and were allowed to remain over night during the twenty-four hours. The remedy was well borne by the patients, and no serious burns were inflicted. In cases of pneumonia, influenza, and acute bronchitis mustard was found to be an excellent substitute for morphine and other narcotics. In phthisis and pleurisy, it is a valuable adjuvant; smaller doses of the narcotic employed were sufficient to produce the

desired effect. In relieving the cough the mustard improved the pulse and the respiration of phthisical cases.

ANTISEPSIS.—Roswell Park has called attention to the remarkably efficient properties possessed by mustard as an antiseptic or sterilizing agent for the surgeon's hands and for the skin of the parts to be operated upon. His custom is to scrub his hands thoroughly with a mixture of green or other soap, corn-meal, and mustard-flour, using this for about five minutes. After rubbing it thoroughly into all the crevices and creases of the hands and nails by aid of a nail-brush, one may be absolutely certain that his hands are sterilized, no matter what he may have been doing previously. Mustard is an admirable deodorizing agent, and will take away from the hands all offensive odor of dead or dying tissues, iodoform, etc.

MYALGIA. See RHEUMATISM and MUSCLES, SURGICAL DISEASES OF.

MYELITIS. See SPINAL CORD.

MYOCARDITIS.

Definition.—Myocarditis is a change in the heart-muscle, the character of which may be either inflammatory or degenerative, resulting in a diminished integrity of the tissue.

Varieties.—The disease may either be acute or chronic, local or diffuse. The acute and the chronic forms are so different in their origin and course that they seem more like two separate diseases than modifications of a single disease. In both, however, the important result from a clinical stand-point is the deterioration of the muscular fibre and consequent impairment of function.

Symptoms.—I. ACUTE MYOCARDITIS may have an abrupt onset; but it is more often insidious, merging itself with the

symptoms of the primary disease, for acute myocarditis is always the result of some previous morbid condition. Its beginning may be attended by an increase of fever, or even a true rigor; the patient may complain of discomfort or pain in the cardiac region. The pulse becomes rapid and feeble; and, if an unfavorable course is taken, it subsequently grows weak and intermittent, and, toward a fatal termination, noticeably infrequent.

Literature of '96-'97-'98.

Parenchymatous myocarditis in children manifests itself by asystole, lasting some days to several months, without change in the cardiac rhythm. Weill and Barjon (*Rev. Mens. des Mal. de l'Enfance*, Dec., '96).

In cases of myocarditis pressure on the region of the heart gives rise to a much more heightened activity of the heart and increased volume of the pulse than in healthy persons. De Renzi (*Rivista Clin. e Terap.*, No. 2, '97).

Dilatation ensues, as shown by a displacement of the apex-beat toward the left and an increase in the area of cardiac dullness. The first sound at the apex becomes feeble and indistinct; there may be heard at the same place a gallop-rhythm. At the base of the heart the pulmonic second sound may be accented and reduplicated. The general condition of the patient shows the stress of his illness, he lies prostrate in bed with pulmonary congestion, dyspnoea, increasing cyanosis, and perhaps coma or delirium.

The imperfect circulation may occasion a scanty and albuminous urine; enlargement of the liver, perhaps accompanied with catarrhal jaundice; and catarrh of the stomach, with vomiting. The condition thus sketched is not invariably present; milder attacks serve merely to aggravate the general weakness of the patient, and to delay, but scarcely to compromise his recovery.

II. CHRONIC MYOCARDITIS. — This process varies greatly in rapidity. Some cases of this class may prove fatal so early as to make the term "chronic" seem inappropriate. Others progress slowly for a time, and terminate abruptly in unexpected death. Still others—and these are the majority—develop gradually and bring the patient to his end by a slow process which may extend over many years. Cases are also found, post-mortem, which have not given rise to important symptoms even up to the time of death, to which event the change in the myocardium has not at all contributed.

When the process is gradual the symptoms are mainly those of diminished cardiac efficiency. There may be pain or uneasiness in the præcordium or attacks of true angina pectoris. Dyspnoea appears at first after some unusual muscular effort; it gradually becomes more marked, and may at last render the patient unable to utter more than a few words at a time without pausing for breath. Dyspnoea may also come on in a paroxysmal way, resembling attacks of asthma, and often described by the term "cardiac asthma." In early stages the pulse may be more frequent than in health, and of good strength or even somewhat more than normal tension. As the heart becomes more affected the pulse becomes weak, irregular, intermittent, and in many cases infrequent.

In this chronic form, also, as well as in acute myocarditis, the heart is apt to be enlarged, and the apex-beat may be displaced downward as well as outward. It is the rule to find dilatation of one or both ventricles; the left is more often the one affected. In some cases there is also more or less hypertrophy of the muscle-walls. The influence of muscular exertion upon the action of the heart is an important criterion of its integrity,

and in suspected cases this test should never be omitted. The climbing of a single flight of stairs, for instance, may amply demonstrate the precarious condition of the circulation. The dilatation of the left ventricle often occasions relative insufficiency of the mitral valve, and a consequent murmur of mitral regurgitation heard at the apex, and transmitted to the left axilla, with accentuation of the second pulmonic sound at the base of the heart. The heart's impulse may be extensive, but feeble in character, striking against the chest a quick, weak, blow. Sometimes, however, the apparently vigorous efforts of the heart are striking even when the radial pulse is feeble and ill sustained.

The brain being imperfectly supplied with blood, we may have such cerebral symptoms as vertigo, loss of memory, wakefulness, headache, delirium, and coma. The lungs may suffer from bronchial catarrh, oedema, or hydrothorax. The Cheyne-Stokes mode of respiration may be observed, especially near death. The digestive and renal changes may be the same as with the acute form of the disease. It is not only true that the urine is scanty under such conditions, but it is also deficient in the proportion of waste-products which it contains, the retention of which poisonous material in the system has been regarded as one cause of the asthmatic seizures already mentioned. The patient is also subject to attacks of syncope. These may be slowly recovered from, and even fatal. Again, a fatal termination may occur during an attack of angina. In other cases death comes more gradually with the well-known symptoms of cardiac dilatation.

Case of chronic fibrous myocarditis in which the signs of aortic regurgitation were pronounced, though the autopsy showed that the valves were entirely nor-

mal. Edwards (Amer. Jour. Med. Sci., Oct., '95).

Literature of '96-'97-'98.

A case of syphilitic myocarditis. Patient had rapid pulse, arrhythmia, and a split second sound at the base. The aortic second tone was accentuated; the area of cardiac dullness extended somewhat to the right. Treatment with tincture of iodine and strophanthus caused rapid improvement in the subjective symptoms; a systolic murmur developed over the pulmonary artery, and occasionally one could be heard in the mitral region. The arrhythmia continued. Rosenthal (Deut. med. Woch., Apr. 1, '97).

Diagnosis.—Absolute certainty with regard to the existence or non-existence of myocarditis in any particular patient is often difficult, if not impossible; and certainly any candid clinician who has had opportunities of comparing his ante-mortem diagnoses with post-mortem appearances will acknowledge the liability to error here. Fatty degeneration of the heart may give rise to many of the symptoms above enumerated; and it is often associated with arteriosclerosis; but it is rather less likely to cause angina pectoris. Moreover, the heart-sounds and the apex-beat are apt to be less distinct in fatty degeneration than in some instances of the disease under consideration. Absolute certainty in differentiating these two diseases is at present impossible.

Alcoholic drinks in any form may lead to myocarditis when used in excessive quantity. Proceeds very gradually; majority of patients well nourished and corpulent. Shortness of breath, pressure in præcordia, dyspnoea, and increase in the heart-dullness observed. Aufrecht (Deut. Archiv f. klin. Med., B. 54, H. 6, '95).

Valvular disease with failing compensation may produce a very similar symptom-complex. We have already seen that myocarditis may occasion mitral insuffi-

ciency; it may also be associated with aortic regurgitation, both conditions being associated with atheroma of the aorta. Furthermore, chronic myocarditis may exceptionally occasion narrowing of the tissues at the base of the heart in such a manner as to cause stenosis of the aorta or pulmonary artery. The right ventricle may dilate as well as the left, causing tricuspid regurgitation. Conversely, chronic valvular disease with failing compensation may give rise to chronic myocarditis. The main factors which would enable us to distinguish to some extent between the valvular and myocardial disease are: first, etiology; and, second, the history of the individual case. If a patient has no cardiac murmur whatever, and yet presents other well-marked signs of cardiac disease, we are more justified in regarding the case as myocardial than as valvular; and yet severe mitral stenosis may exist without any audible murmur. The most characteristic symptoms of chronic myocarditis are: persistent slowness of the pulse, especially if associated with arrhythmia, angina pectoris, and sclerosis of the peripheral arteries.

Diagnosis of chronic myocarditis can often be made with certainty. The irregularity of the heart's action, the total loss of rhythm, is the characteristic feature of myocarditis, and is pathognomonic. In those other diseases the irregularity is always a late manifestation, and is due to an insufficiency of the heart-muscle that is secondary to other disease. In all other cardiac affections the regularity of the heart's action is restored as soon as digitalis or other heart-tonics have wrought their effect. Not so with myocarditis. Riegel (*Zeit. f. klin. Med.*, B. 14, H. 4, '88).

[Personally, we are inclined to the belief that there is no single symptom which can be relied upon as a sure indication of myocarditis. Even disturbance in the coronary circulation may quite possibly cause as much cardiac failure in the nervous element as in the myocardial.

The diagnosis must be negative rather than positive. Absence of the distinct evidences of valvular disease in connection with arrhythmical action of the heart becomes of itself a positive sign. A. L. LOOMIS and C. E. QUIMBY, Assoc. Eds., *Annual*, '89.]

Literature of '96-'97-'98.

Diagnostic criteria for distinguishing cases in which the morbid element is the muscular fibre, from the interstitial myocarditis which is part of the general arteriosclerotic process in cases evincing the vascular change: In the former the evidences of failure are largely limited to the heart; in the latter there is a more general affection of the organs and structures of the body. Lemoine (*Nord Méd.*, May 6, '97).

Etiology.—I. ACUTE MYOCARDITIS is always secondary to some infection: either through a perforating trauma or by means of the blood or by continuity of tissue. It complicates typhoid fever, scarlet fever, diphtheria, variola, cerebrospinal meningitis, pneumonia, influenza, malaria, rheumatism, and, in rare instances, tonsillitis. It may also be caused by sepsis, as in malignant endocarditis, puerperal fever, osteomyelitis, erysipelas, and gonorrhœa. In some instances the specific germs of these various infections are carried to the heart with the blood; this has been demonstrated in the case of typhoid fever, septic diseases, and gonorrhœa. There is also clinical reason to believe that myocarditis may be occasioned by the toxins of infectious diseases; and, indeed, this has been demonstrated experimentally in the lower animals.

Myocarditis in children occurs either as circumscribed patches throughout the organ or as a diffuse change. In such cases it is especially apt to depend upon some septic or infectious disease, as diphtheria and pyæmia. Steffen (*Jahrbuch f. Kinderh. u. phys. Erzie.*, B. 27, H. 3, '88).

Two fatal cases of myocarditis in the

course of enteric fever. The first sound of the heart disappeared several days before death. Galliard (*Le Bull. Méd.*, June 17, '94).

In typhoid fever the highest grades of parenchymatous degeneration are reached by the end of the second week, and then slowly subside. Interstitial myocarditis usually begins at the end of the second week. In scarlet fever interstitial myocarditis begins as early as the fourth day; in diphtheria, about the seventh or ninth day; and in each it reaches its height about the end of the second week. Romberg (*Virchow's Archiv*, vol. cxxxiii, H. 2).

Literature of '96-'97-'98.

There exists in infants an acute parenchymatous myocarditis especially in the course of a chronic endocarditis. This myocarditis seems to be derived from an infection provoked by rheumatism and probably by other general diseases, certainly by erysipelas. It manifests itself by an asystole of from some days' to some months' duration. It is characterized symptomatically by the absence of all modification of the cardiac rhythm. Anatomically there exist a parenchymatous myositis with development of protoplasm at the expense of contractile substance, dissociation and thinning of the elementary fibrils, proliferation hypertrophy of the nuclei, and diminution of the muscular striæ, and absence of interstitial or vascular lesions. Weill and Barjon (*Rev. Mens. des Mal. de l'Enfance*, Dec., '96).

In pericarditis and endocarditis there is a superficial inflammation of the adjacent cardiac muscle.

II. The CHRONIC FORM of myocarditis sometimes ensues upon the acute process; it may develop as a result of venous stasis in advanced valvular disease, or in prolonged obstruction of the pulmonary circuit by chronic emphysema, fibroid phthisis, and pulmonary atelectasis. By far the most important cause, however, is arteriosclerosis, with which, therefore, its etiology coincides. Important in-

fluences favoring the development of both arteriosclerosis and chronic myocarditis are: heredity, the male sex, advanced life—over forty, chronic alcoholism, syphilis, gout, lead poisoning, chronic nephritis, severe muscular labor, and excessive mental exertion or anxiety. So far as the volition of the individual is concerned, the etiology might, perhaps, be summed up in one word: "excess." The process is favored by cachectic conditions; for example, carcinoma, tuberculosis, inanition. The chronic process is a result of malnutrition of the myocardium. This may depend partially upon the poor quality of the blood-supply; but would seem to be very much more influenced by the amount of blood which flows through the cardiac vessels. Venous stasis diminishes the rapidity of flow in normal channels, arteriosclerosis diminishes the lumen of the arteries. An atheromatous plate may cover the origin of a coronary artery, or the artery may be narrowed by an hypertrophy and contraction of its coats; and thrombosis or embolism may completely obstruct it.

Causes which tend directly to some form of myocardial degeneration are: 1. Overwork. 2. Defective nerve-supply or control. 3. Deficient nutrition, from (a) disease or obstruction of vessels, (b) impoverished or poisonous blood. 4. Reflex vasomotor or sympathetic irritation (genito-urinary). 5. Limit of compensation. Bruce (*Practitioner*, Jan., '88).

[The causes of cardiac degeneration include all the causes of defective nutrition, either local or general, *i.e.*, (1) interference with the coronary circulation; (2) deficient or abnormal elements in the blood. Among the most prominent of these last is chronic Bright's disease. A. L. LOOMIS and C. E. QUIMBY, Assoc. Eds., *Annual*, '89.]

Literature of '96-'97-'98.

Certain cirrhotic conditions of the heart, usually attributed to ischemia of

that organ, are in reality due to chronic congestion. Pasquier (*Revue de Méd.*, Nov., '97).

Recent writers (Déhio, Radasewsky) describe a diffuse microscopical myofibrosis affecting chiefly the auricles and associated with the most varied cardiac lesions of the heart, which is referred to excessive tension of the heart-walls. It is found with various valvular lesions, emphysema, and interstitial nephritis, and may develop in persons as young as fifteen to thirty years of age.

Pathology.—I. ACUTE MYOCARDITIS.

—There may be a diffuse purulent process affecting primarily the interstitial tissue and secondarily the muscles. This sometimes occurs in scarlet fever and also in other instances from unknown causes. Localized suppurations or abscesses are far more common and are due to infective emboli in the septic diseases mentioned before under ETIOLOGY. Broken-down muscle-fibre and bacteria are mixed with the pus in these abscesses. They may be as minute as the head of a pin or as large as a filbert. One was found to contain an ounce of matter. Later results of these abscesses are various. They burst into the pericardial sac and cause purulent pericarditis. If located in the septum they may open an abnormal communication between the heart's cavities. Rupturing through the base of the heart they may cause an abscess in the mediastinum. If situated in the walls of the ventricles they may discharge into one of the cavities of the heart and give rise to diffuse sepsis; or they may cause rupture of the ventricular wall, with sudden death from hæmorrhage; or finally they may, in very rare and fortunate instances, be absorbed and capsulated.

These purulent processes are almost invariably fatal. The ordinary infectious

fevers, such as typhoid, pneumonia, and the like, above enumerated, do not occasion so grave disturbances. Between the muscular fibres are found leucocytes and proliferating nuclei, which may go on to form new connective tissue. The blood-vessels are enlarged and engorged. The muscular fibres are more or less affected. The nuclei may disappear, the striæ become indistinct, and the fibres granular or even fatty. In limited areas there may be found associated with this parenchymatous degeneration, especially in the case of prolonged fevers, a hyaline change, the muscular fibres becoming swelled, homogeneous, and translucent, and their striæ very faint or entirely absent.

The degree of the parenchymatous myocarditis just described varies greatly in different cases. Its severity does not run parallel with the height of the fever, but bears a close relation to the virulence of the specific intoxication.

Myocardium examined in 13 cases of diphtheritic myocarditis. There was granulo-fatty degeneration of the muscular fibres, with hyperplasia of the cells of the connective tissue and swelling and proliferation of the nuclei. In some of the cases there was hæmorrhagic exudation in the myocardium. G. Schemm (*Virchow's Archiv*, B. 112, H. 2, '91).

Anatomically, the lesion in acute rheumatic myocarditis consists, in the mildest cases, of a slightly granular condition of the muscular fibre and slight alteration of the striation. In a more advanced degree granular degeneration is more marked, and is associated with multiplication of the nuclei of the muscle-fibres. Some fibres may appear swelled and hyaline. In a third condition,—the phase of atrophy,—the fibres become very thin or are broken down, and at the same time the connective tissue becomes more abundant. The latter is especially developed about the blood-vessels. The intima also becomes thickened; so much so, at times, as to obliterate the smaller

vessels, and even considerable trunk. Hæmorrhagic infiltration follows in such cases.

The myocarditis may involve the entire cardiac muscle, including the papillary muscles. Peter (La Sem. Méd., Mar. 14, '91).

In a severe case of gonorrhœa the pericardium was universally thickened and swelled and contained numerous widely-dilated blood-vessels with thin walls.

The blood found in the pericardial cavity came from the rupture of these vessels. In some places, the lesions of the myocardium, although most intense near the endocardium, appeared to extend from the pericardium and could be traced directly to this. The muscular fibres showed various degrees of degeneration. In the slightest change they appeared slightly swelled, diffusely stained, their nuclei had disappeared, and they frequently contained vacuoles. There was every degree of change from this up to a total necrosis of the muscular fibres, and an entire substitution of areas of purulent infiltration and necrosis for the normal tissue of the heart. Some of the areas of degeneration involved almost the entire thickness of the wall of the ventricle and auricle. Extensive hæmorrhage was found in some of the necrotic foci. Gonococci were found in the sections in considerable numbers. W. T. Councilman (Amer. Jour. Med. Sciences, Sept., '93).

Cystic degeneration of the muscular fibres in a number of cases. This condition found most marked in the fibres of the papillary muscles of the left ventricle, though common in all other parts of the heart as well. The degree of the excavation varies exceedingly. The destructive process in its most extreme form removes the whole of the muscular substance from the centre of the fibre, no part of which, when examined with the microscope, will present the usual appearance, and even these may show the cross-markings characteristic of heart-muscle only in places. The muscle-nuclei often lies loosely in the cavities. A. V. Meigs (Amer. Jour. Med. Sci., May, '92).

The present prevailing conception of

this acute infectious myocarditis is that the injury to the muscular fibre is the primary condition, and that the interstitial changes are a reactive inflammation, secondary to the disorganization of the muscle.

II. The CHRONIC FORM of myocarditis is generally regarded as merely a degenerative, and not an inflammatory, process. Other names for it are chronic interstitial myocarditis; fibroid myocarditis; and fibroid infiltration, or cirrhosis, of the myocardium. Its most frequent causes are lesions of the coronary arteries. It may also be associated with chronic pericarditis and chronic endocarditis. Occasionally it is seen where none of these diseases exist. It may be comparatively diffuse or circumscribed, the parts most commonly affected being the left ventricle and the septum between the ventricles, and in these portions of the heart it is more marked near the apex than near the base.

It consists in a growth of new connective tissue between the muscular fibres, which latter atrophy and degenerate. The process may be one of very slow development, corresponding with slow diminution in the lumen of the corresponding artery, or it may begin abruptly as the result of embolism, or more frequently thrombosis, of the coronary artery or one of its branches. The anterior or left coronary artery is the one most apt to be diseased; hence the frequency of the change in the left ventricle.

When the lumen of the artery is suddenly closed, the portion of the heart dependent upon that artery for nutrition becomes necrotic.

The muscular fibre breaks down into granular *détritus*, and the connective tissue undergoes a retrograde metamorphosis; so that the affected portion be-

comes yellowish white or gray and of soft consistency. It may be also of a dark-red color from the blood and present the appearances of an hæmorrhagic infarction. This softened area of myomalacia may occasion rupture of the heart or acute inflammation; or it may be gradually absorbed and superseded by new connective tissue, which finally shrinks into a scar.

The portion of the heart affected by interstitial degeneration is thinner than normal. The remainder of the heart may become hypertrophied to a certain extent; finally, it is almost certain, if life is prolonged, to become dilated. The fibroid spot may be so situated as to make no great difference in the contour of the heart-wall, but, if situated toward the apex of the heart, it may yield to the tension of the contained blood and give rise to a cardiac aneurism. Such an aneurism may be found after death in cases where it has not greatly affected the health of the patient. Or, again, it may finally rupture and cause sudden death, or it may become so large as fatally to impede the activity of the heart. Furthermore, on the internal surfaces of cardiac aneurisms thrombi are apt to form, and these may give rise to embolic processes. In some cases the fibroid parts of the heart exhibit a calcareous deposit.

When chronic myocarditis is the result of pericarditis or endocarditis, the process is a diffuse one and superficial, involving the fibres adjacent to the inflamed membrane. As already stated, valvular disease of chronic pulmonary obstruction, in their terminal results of cardiac dilatation and venous stasis, may give rise to fibroid changes in the heart-muscle. These are more or less diffuse. They may demand careful microscopical examination in order to be detected, and their symptoms merge with and aggravate the effects of the original disorder.

Results of extensive studies upon the subject of fibroid degeneration and allied lesions, as relating to the heart and coronary arteries more particularly. A very sharp distinction must always be drawn between true atrophic fibroid degeneration and interstitial myocarditis; although similar in their results, they differ very markedly in their mode of production, and the former is the much more common lesion than the latter. The influence of a morbid state of the coronary arteries must be taken into account in considering all diseases of the heart, but especially those of the myocardium, and no examination of the heart can be regarded as complete which does not include a careful investigation of the state of these vessels. Steven (*Lancet*, Dec. 24, '87).

Prognosis.—I. ACUTE MYOCARDITIS.—

Diffuse suppuration or abscess-formation is almost invariably fatal. The parenchymatous changes associated with infectious diseases aggravate the patient's malady and lessen his resistant powers, but they are of comparatively favorable prognosis. Undoubtedly very many more of such cases recover than die. As in many other conditions, recognition of the danger is of great advantage to the patient. The avoidance of undue exertion and the careful nursing and feeding of the sufferer contribute much to his safety.

The prognosis of acute rheumatic myocarditis is much more favorable than in case of endocarditis, for complete recovery follows, except in cases that are immediately fatal. In the acute condition death may occur in syncope. Peter (*La Sem. Méd.*, Mar. 14, '91).

II. CHRONIC FIBROID MYOCARDITIS.—

The prognosis varies with the abruptness and the extent of the degeneration. Slow diminution of the lumen of a large branch of the coronary artery, even down to practical occlusion, may sometimes be endured by the heart without very marked embarrassment, whereas the

thrombotic closure of the same vessel may result in immediate death; but between these two extreme instances are many degrees of disturbance. Minute patches of fibroid degeneration hardly affect the heart's activity. More diffuse changes, however, impair its functional ability. In particular, it proves unequal to any unusual demand upon it. Then, finally, even under ordinary conditions it can no longer maintain the circulation, and the signs of cardiac failure gradually develop.

The prognosis in an early stage of the process may be said also to depend in considerable degree upon the intelligence of the patient, his self-control, and his ability to fulfill the demands of treatment. The hard-drinking longshoreman beginning to break down under arteriosclerosis is sure to fail more rapidly than the fortunate individual who can withdraw from business activity and enjoy years of easy travel in Europe.

Treatment.—We have no efficient treatment for the acute suppurative form of myocarditis. Prophylaxis is desirable so far as it can be attained. For example, the writer would advocate in specific urethritis the administration of salol or some other antiseptic which is excreted with the urine. Whatever tends to cut short the original disease will lessen the chance of this secondary cardiac disturbance. It may possibly be that antistreptococcic serum, if injected, might aid in prophylaxis. Further than this the treatment can be merely supportive and stimulating. Where there is præcordial distress, hot applications may be made or a sinapism applied. Some authors recommend ice-bags, but in view of the extreme feebleness of the patient it is a question whether cold might not prove depressing.

The acute parenchymatous form of

myocarditis, associated with the infective fevers, does not demand essentially different treatment from that suitable for the original disease. What has already been said about external applications will apply in these cases also, and, if signs of cardiac embarrassment develop, the diet must be restricted and simplified and stimulants and heart-tonics exhibited. The patient should not be allowed to make any unnecessary efforts so long as the pulse remains irregular and intermittent. Death has more than once occurred as the result of sitting up suddenly in bed after prolonged fever.

Chronic myocarditis should be treated in the first place by removing or mitigating its causes, so far as possible. The patient's activities, both physical and mental, should be carefully limited and directed. The diet is of much importance, overfeeding and indulgence in alcoholic beverages being harmful. An exclusive milk diet will sometimes prove of great benefit. In any case, the amount of food taken at any one time should be rather moderate and the varieties such as are of easy digestion. In incipient cases moderate and regular exercise is beneficial. Sudden and violent exertion is harmful and may be dangerous, but walking on level ground or playing golf, or even riding the bicycle, if hill climbing is avoided, are proper. In less vigorous persons massage is of great value. The Nauheim system of medicated baths and resisted movements is excellent for properly-selected cases, and in some instances the results have been most fortunate.

With regard to drugs, iodide of potash in moderate doses, such as 10 grains three times a day, if long-continued, may promote the nourishment of the heart. Iron and arsenic are also suitable tonics. If cardiac failure begins to show itself we must have recourse to tincture of digi-

talis, tincture of strophanthus, and sulphate of sparteine. Strychnine long continued in moderate doses may be of marked value in strengthening and regulating the heart. For cases where the amount of urine is very deficient diuretin sometimes works well. It may be given in divided doses to the amount of 60 to 90 grains in twenty-four hours.

Tincture of piscidia erythrina is strongly recommended for the continued painful cardiac sensations often encountered in cases of chronic myocarditis. No disadvantages follow doses of 20 drops in the morning and afternoon. As much as 80 drops daily may be given, and continued for a month without interruption. As the tincture does not keep well, it should be prepared only in small quantities. Liégeois (*Medical Age*, June 25, '92).

Literature of '96-'97-'98.

Digitalis is of little use in chronic myocarditis, but bleeding to the extent of nine or twelve ounces is calculated to be beneficial by reducing the congestive state of the heart, which underlies the chronic myocarditis. Pasquier (*Revue de Méd.*, Nov., '97).

In the final stages the treatment is the same as in cardiac dilatation, to which subject (see DILATATION OF THE HEART) the reader may refer. In most instances it is very unsatisfactory, the heart responding very imperfectly to any therapeutic appeals.

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MYOPIA.—Gr., *μύειν*, to close, and ὄψ, the eye. The term alludes to the partial closure of the lids to render vision less indistinct, by narrowing the circles of diffusion on the retina: an action of which myopes generally learn the benefit.

Definition.—That error of refraction in which the principal focus of the

dioptric surfaces lies in front of the retina. Rays parallel when they enter the eye come to a focus in the vitreous, and diverge again, forming a circle of diffusion upon the retina. The eye is too long antero-posteriorly, as compared with the curve of its surfaces.

Symptoms.—The elongation of the eyeball may be part of its general enlargement in all directions, and in any case makes the front of the eye prominent, so that it looks large. In high myopia this elongation is very evident when the eye is turned strongly toward the nose. The pupil is often large and the anterior chamber deep. The expression of the patient is likely to be rather vacant. He is unable to perceive much of the facial expression of others, and hence does not learn to respond to it by facial movements of his own. All distant vision is indistinct; the myopic child, therefore, is at a disadvantage in many games; and is inclined toward reading and other amusements requiring only distinctness of near vision. The constant effort to bring the eyes near to the object looked at is likely to cause an habitual stoop.

Myopia of high degree is mostly attended by divergent strabismus. The elongation of the eyeball makes it very much harder to turn in its socket, and the limiting of the range of distinct vision to a near point compels the myope to converge his eyes more and more constantly than the normal. As the myopia increases, this need and difficulty of convergence increase, until the effort becomes too great to be habitually sustained and binocular vision is given up, and the worse eye allowed to squint. The process of elongation of the eyeball is, in the vast majority of cases, distinctly pathological and attended by changes in the coats of the eye, especially by dis-

turbance and atrophy of the choroid in a crescentic area at the temporal side of the optic disk: the so-called myopic crescent. In high myopia the vitreous humor usually shows opacities and may be abnormally fluid, the crystalline lens is liable to become partly opaque, and the retina often becomes detached. Distant vision is always worse than near vision; but the latter may also be very imperfect. Excessive efforts of convergence may give rise to headache, vertigo, or the inflammatory symptoms of eye-strain.

Among 1240 cases of myopia 180 instances were found of the monolateral form of the disease. Corneal astigmatism is more common and exists in a higher degree in myopic than in non-myopic eyes, the frequency and degree of this astigmatism in myopes increasing with the degree of myopia. The monolateral type is not congenital in origin, traumatism and inflammation of the cornea being doubtless the cause of the condition in subjects already predisposed to myopia. Martin (Ann. d'Ocul., July, '94).

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Analysis of over seventeen hundred cases of myopia recorded in private practice, showing that 7.6 per cent. exceeded 10 D. Among these it was rare to find vision above 0.4. In many instances it was much less, while in four cases it reached $\frac{20}{30}$, and so continued during years. Circumoptical atrophy was common, and lesions at the macula presented themselves in varying degrees. H. D. Noyes (Archives of Ophth., July, '98).

Diagnosis.—Myopia is recognized and measured by: the improvement of vision by concave lenses, the weakest lens giving the best distant vision being the measure of the myopia; the blurred image in the direct method of ophthalmoscopic examination, rendered clear by a concave lens which corrects the myopia; and the reversal of movement by skiascopy, the distance of the point

of reversal from the eye being the focal distance of the correcting lens.

Etiology, Pathology, and Varieties.—

Myopia may be due to excessive curvature of the cornea, or crystalline lens,—*myopia of curvature*,—or to an increase of refractive power in the lens-substance,—*index myopia*; but the great majority of cases are due to elongation of the eyeball,—*axial myopia*. Myopia is often observed temporarily for a few weeks or months after an attack of iritis or iridocyclitis,—*inflammatory myopia*. This is probably due to alteration of curvature in the lens, although an alteration of index has been suggested. Prior to senile or diabetic cataract myopia may develop, probably by increased refractive index of the lens-nucleus. This change enables old people who have previously required convex lenses to read without them, and is therefore called "second sight." It is but a temporary benefit, and not an un-mixed good.

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In ordinary myopia the lengthening of the globe, and its increase in refractive power, are due to the action of the oblique muscles in their endeavors to prevent the deviations of the vertical meridians, as well as to changes in form of the orbital cavities and in the relation of the globe and its musculo-aponeurotic annexes, which take place with the growth of the child. To exercise of binocular vision, necessitating the patient to converge and to look down. Fevrier (Ann. d'Ocul., Sept., '96).

Instance of evanescent functional myopia observed in a patient the subject of diabetes mellitus. The myopia subsided with the disease. Appenzeller Rentlingen (Centralb. f. Prak. Augenh., May, '96).

The mass of cases of myopia develop in eyes, not myopic at birth, from excessive strain of near-seeing. Heredity, bad hygienic surroundings, and impaired

general health are predisposing causes. But the efficient exciting cause is excessive near work for the eyes. During near vision the eye-muscles are actively innervated, and the eyeball compressed laterally between them; so that there is a constant tendency to force it to elongate. The condition of congestion of the choroid and inflammatory softening of the sclera, that develops under excessive use of the eyes for near work, causes the sclera to give before the intra-ocular pressure; and permanent change in the shape of the eyeball results. As myopia increases, distant vision becomes less perfect, the range of clear vision more restricted, the efforts of convergence of the eyes greater and more constant; and at the same time the sclera is thinned by distension and less able to withstand the pressure of its contents. In this way the myopia tends to go from bad to worse, becomes "progressive"; and, when this progress has become so great that it cannot be checked, it is said to be "malignant myopia."

The idea has sometimes been entertained that use of the accommodation tended to increase myopia by increasing the intra-ocular tension; but this is directly disproved by both clinical and experimental studies of the subject. Many hypotheses have been advanced regarding myopia without any sufficient basis of facts, namely: that heredity acted by determining the proportions of the cranium or the shape of the orbits, or that a special diathetic or vascular condition was the chief determining factor in the case. The large number of myopic eyes that also exhibit considerable astigmatism make it probable that strain of the eyes from astigmatism, causing choroidal disturbance and scleral softening, is an important factor in many cases.

Family history, etc., of 330 young myopes examined. An hereditary influence was certain in 216, or in 65 per cent. This hereditary form appears earlier, advances more rapidly, is higher in degree, and has more frequent complications than the acquired type. The father more frequently passes his defect to the daughter, the mother to the son. Motais (*Le Bull. Méd.*, June 12, '89).

Of 546 eyes examined between the period of infancy and six years of age, 24 were found to be myopic. The latter condition was found to increase very markedly between the thirteenth and twentieth years, when it became stationary. Herrnhiser (*Schmidt's Jahrbucher*, Mar. 15, '93).

The two chief factors in the production of myopia among scholars are, first, the long use of the eye for near work, and, second, insufficient bodily exercise. Martin (*Jour. de Méd. de Bordeaux*, Nov. 26, '93).

Eyes of 1000 scholars examined in the private and public schools of Cincinnati and over 300 cases of myopia found. Most of these, probably 70 per cent., were of a low degree, and occurred principally in the elementary divisions, but in the more advanced school-grades there was much larger percentage of the higher degrees of the disease. Dowling (*Times and Register*, July 25, '91).

From an examination of the eyes of 3002 children attending some of the Aberdeenshire Board Schools, it was found that a large percentage (13.4) of myopia exists, especially in the school where education is pushed; while in the country-schools the percentage of myopia is small, never rising above 10 per cent. George Ferdinands (*Brit. Med. Jour.*, Sept. 12, '91).

From an examination of the eyes of over seven thousand school-children of Antwerp it was found that 2.13 per cent. were myopic. Before the age of 10 years 1.16 per cent. had myopia, 1.33 per cent. being boys and 0.99 per cent. girls. After the age of 10 years 3.10 per cent. were myopes: 3.88 among girls and 2.37 among boys. In well-lighted schools 1.63

per cent. of the scholars were found to be myopes, 1.74 per cent. being girls and 1.57 boys. In badly-lighted schools, 3.75 per cent. of the scholars were myopes; of these 4.83 per cent. were girls and 2.67 boys. Bad light and increasing age, with increased demands made upon the eyes by study, are powerful factors in the development and augmentation of myopia. De Mets (*Jour. d'Hygiene*, Sept. 15, '92).

Treatment. — Myopia should be corrected by concave lenses, which should be worn constantly. For young persons the exact optical correction should be worn all the time; although in rare cases it may be better to use a weaker lens for a time for near work. Presbyopes will always require, for near seeing, a lens sufficiently weaker to make up for their presbyopia. The correcting lens gives the myope distinct vision and the visual range of the emmetropic eye; and places the check of accommodative effort upon the tendency to excessive convergence. Correcting lenses may be unsuitable for those cases in which binocular vision, and therefore strain of convergence, have previously been given up; or where the vision is so imperfect, or the mifying effect of the correcting lenses so great, that objects will still be held close to the eye to gain the benefit of larger retinal images.

The incomplete correction of myopia, unless the glasses are so weak as to be of no material benefit, is extremely dangerous. By looking through such lenses obliquely the myope soon finds that he can see farther and more distinctly than by looking squarely through them; and he soon falls into the habit of looking obliquely. But looking obliquely through a lens the pencil of rays received by the eye is rendered astigmatic, and the evils of high uncorrected astigmatism are thus entailed. When the full

correction for the myopia is worn, looking obliquely through the lenses makes vision worse and is instinctively avoided.

The wearing of correcting lenses enables the myope to reduce his efforts of convergence to nearer the normal. But there still remains the increased difficulty of turning an elongated eye in its socket. To help still farther, the amount of near work required of such eyes must be limited, and surrounded with the most favorable conditions, including the use of the best illumination and a correct posture, with frequent interruptions during which the eyes are permitted to rest on distant objects. These precautions are of the greatest importance during childhood and adolescence, when myopia begins and shows the most general tendency to increase.

Series of tables from observations based upon the results obtained from an examination of 200,000 formulæ for spectacles and eye-glasses in Philadelphia. The whole number of eyes for which distant glasses has been furnished by the optician was 187,018, of which 21.6 per cent. were for myopia. Of these, 39.5 per cent. were for simple myopia, while 60.5 per cent. were for myopic astigmatism. Among the private cases, however, where the refraction had been done under mydriasis, 22 per cent. were myopic; of these, 9.67 per cent. were instances of simple myopia, while 90.33 per cent. were astigmatic in varying degrees. In a very large number of patients there was mixed astigmatism on one side, while on the other there was either simple or compound myopic astigmatism, similar pathological symptoms being present in both eyes. The percentage of myopia was 3 per cent. higher among private cases than among those selected from the books of the optical companies. The progress of the increasing refraction, both in percentage of cases and in the degree of the increase, was arrested by the treatment and glasses received. Risley (*Archives of Ophthal.*, July, '94).

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Persons with high degrees of myopia can wear full correction with comfort. Lenses can prove satisfactory only when adapted to the eye with the greatest accuracy. Full correction is much more satisfactory and beneficial to the patient than partial correction, because in the latter condition the patient, by looking through the lens obliquely, while getting a higher strength produces at the same time an astigmatism which is highly injurious. Another cause for the impression that high myopia cannot be relieved by glasses is in the difficulty of becoming accustomed to such glasses. The removal of the lens from such an eye is of considerable risk. Jackson (*Med. and Surg. Reporter*, July 3, '97).

In the case of myopes, glasses prescribed correcting the entire amount of myopia present, but at the same time allowing for any spasm of accommodation so frequently to be found in young persons, the strength of the glass is reduced in dioptries by one-fifth. This method of correction, far from increasing the myopia, in any way, actually induces an improvement in the acuity of vision, with this reservation, that on account of growth of the ocular tunics all myopic persons are subject to a spontaneous increase in the myopia to the extent of 1 or 2 dioptries from the ages of 12 to 20. In cases of weak myopia, under 2 dioptries, treatment by full and early correction has resulted in the entire disappearance of the myopia. M. Dor (*Recueil d'Ophtal.*, No. 6, '97).

The surgical treatment of myopia by removal of the crystalline lens is appropriate for a few cases of very high degree,—15 D. and upward,—in which correcting lenses give unsatisfactory results, although the eyes are capable of good vision. In children the removal is to be effected by a small discission of the lens, repeated several times, if necessary, until the absorption of the lens-substance leaves a clear pupil. In adults the lens may be extracted after a preliminary small discission to render it opaque. The

operation is quite as formidable and dangerous as that of the removal of the opaque lens,—cataract. (See volume ii.) The removal of the crystalline will generally correct about 18 D. of myopia; and the higher the myopia, unless it be due to increased curvature of the cornea, the greater will be the effect of the operation. The removal of the crystalline also gives a larger retinal image than can be obtained through concave correcting lenses, with a correspondingly superior acuteness of vision. In cases suitable for this operation such improvement should amount to 50 or 60 per cent. After removal of the crystalline, although the patient is much less dependent on his glasses, they will still be necessary to secure the best vision; and different lenses will be required for near and far seeing, on account of the loss of all power of accommodation.

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Operative treatment of progressive myopia consists in the removal of the still transparent crystalline lens from the eye, in such cases as those which present a very high degree of myopia, which, in spite of all medical treatment, continues to increase. Two cases show the innocuous nature of the proceeding and the good results which may be achieved by the operation. M. E. Valude (*Recueil d'Ophtal.*, No. 2, '96).

Fourteen operations of the lens in high myopia (in addition to twenty-four already reported). Cases all terminated favorably and showed increased acuity of vision, with no further increase of myopia nor progress of myopic changes in the fundus. Vacher (*Ann. d'Ocul.*, '96).

Removal of the lens for high myopia performed in 114 eyes during the past four years. Great improvement was noticed in the visual acuity, generally after the lapse of many months. The further progress of myopia is permanently arrested, but the operation does

not afford positive security against further involvement of the choroid, nor subsequent detachment of the retina, although the latter is not to be ascribed directly to the operation, but is dependent on the nature of the malady.

Of the 114 eyes, astigmatism was noted before the operation in but 2 (of the same subject). After operation it was present in 35 instances. Von Hippel (*Deut. med. Woch.*, No. 25, '97).

The extraction of the transparent lens is destined to hold its place in ophthalmic surgery as a means of treatment of high myopia where glasses do not afford proper assistance. Panas (*Arch. d'Ophthal.*, Feb., '97).

Operation does not benefit myopes having less than 11 D., while Schweigger's case of 33 D. is the highest thus far reported as having undergone operation. After removal of the lens there is noticed a diminution of the myopia in most cases of from 16 to 13 dioptries, and this greater the higher the myopia. A myope of 7 D. may be found to have become hypermetropic 6.6 D.; and in Schweigger's patient there remained only 13 D. after the removal. A fluid vitreous or a choroidal atrophy is not found to contra-indicate, although it would be better not to interfere if a staphyloma should invade the macula. This procedure is especially applicable to children and young adults; but von Hippel and Sattler have been satisfied with their results in patients as old as sixty-four, and others have operated successfully on patients between the ages of thirty-five and fifty. Discussion, British Med. Assoc. (Boston Med. and Surg. Jour., Jan. 6, '98).

Sixteen cases of extraction of crystalline lens in high myopia: Upward of fifteen dioptries; detachment of retina never met with, but marked improvement of vision never obtained. Simple extraction performed, all of the lens possible being removed. Three days later the wound is opened and remaining masses removed. Later, if necessary, the capsule is extracted. Vignes (*Jour. of Ophth., Otol., and Laryn.*, Apr., '98).

One hundred and forty-two cases of extraction of crystalline lens in high myopia: Sight markedly improved in 85

per cent. Stationary in 10 per cent. Eye lost in 2 per cent. by infective and glaucomatous complications and in 3 per cent. by detachment of the retina. Darier (*Jour. of Ophth., Otol., and Laryn.*, Apr., '98).

Removal of the transparent lens for high degrees of myopia is theoretically most excellent, but, on account of the inflammatory risks, is to be abstained from. Kenneth Scott (*Lancet*, Sept. 24, '98).

One hundred and sixty-two cases of extraction of crystalline lens in high myopia: Free crucial incision made in capsule with a very thin von Graefe knife. To remove lens a long, narrow blade used as a spatula. Loss of vitreous not feared, as very satisfactory results obtained after it has occurred. Operation should not be performed when vision can be improved with glasses sufficiently to enable patient to work. Perfect emmetropia obtained in cases varying from 12 to 23 dioptries. Fukala (*Jour. of Ophth., Otol., and Laryn.*, Apr., '98).

Fukala introduced the treatment of excessive myopia by the removal of the lens. The advantage of this kind of treatment is recognized, but its danger—loss of the eye from hæmorrhage and detachment of the retina—limits the indications to those in which the expected gain in sight greatly outweighed the risk. Herman Knapp (*N. Y. Med. Jour.*, Jan. 8, '98).

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MYXEDEMA.

Definition.—Myxœdema is a chronic functional disorder of cellular metabolism due to structural alteration of the thyroid body and inhibition of its physiological functions.

The disease was first described by Gull under the name of "cretinoid change" and subsequently by Ord under its present name.

Symptoms.—The most striking feature of myxœdema is a general alteration in the appearance of the patient. His body becomes more or less enlarged. The tissues are firm and resisting when struck,

and, though they vibrate or shiver under lateral stroking, they do not pit on pressure. The swelling is usually irregular, being most marked in the face, neck, and supraclavicular spaces, and likewise variable in degree. The infiltration tends to vary with the intensity of other symptoms.

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The swelling of the body is not always uniform or constant. It may, and usually does, appear most strongly in the face and supraclavicular regions. It may, however, be found in the limbs, or in the abdomen, before involving the face and neck. It may in early stages disappear altogether for a time, or it may be transferred from one region to another. The face is particularly subject to alterations in the amount of swelling, generally in association with changes in symptoms, more especially nervous symptoms, disappearance being followed by headache or neuralgia, recurrence by relief of these conditions. William M. Ord (*Brit. Med. Jour.*, Nov. 12, '98).

The abdominal walls being also thickened, the abdomen appears greatly enlarged and pendulous. The extremities are thickened and flattened, the hands being spade-like (Gull), the fingers blunt and sometimes square instead of round. As recently shown by Berkeley, the thickening may be limited to the scalp.

Literature of '96-'97-'98.

Eight cases in negroes in which the skin of the scalp was the seat of thickening, thus differing considerably in characteristics from the ordinary diffuse myxedematous swelling of the skin in sporadic cretinism, or from the myxedema acquired from thyroid changes in later life, yet presenting perfectly the local characteristics of the malady. No description found in either text-book or journal articles. H. J. Berkeley (*Amer. Jour. of Insanity*, Feb., '98).

Dryness and roughness of the skin is

another marked feature of the disease. The surface is rough, rasp-like, especially over the hands and feet. In some parts, however, especially the face, the skin may be comparatively smooth, though dry. That of certain regions—the forehead, the eyelids, etc.—appears transparent and wax-like.

The physiognomy becomes coarse; the face is broad and expressionless; the mouth seems much enlarged, although the cyanosed lips are kept tightly pressed together, owing to greatly-increased thickness. The facial coloring is yellowish, and a circumscribed patch of redness is often present over the upper portion of the cheeks. The nose is cold, its tip being sometimes bluish; it appears flattened and broadened, through the thickening of the nostrils. The ears are also enlarged, thickened, and cyanosed, the meatus being narrowed. The lids droop over the eyeballs, giving the patient an appearance of sleepiness. An effort to open the eyes is first manifested by elevation of the eyeballs. There is lacrymation and copious nasal secretion.

The oral and naso-pharyngeal cavities are markedly involved. Pallor of their lining membrane is a noticeable feature. The lips are greatly thickened, and press against the teeth when the mouth is closed. The mucous membrane of the cheeks doing likewise, it is apt to project between the molars and be bitten. The tongue is generally enlarged and pale. The teeth become brittle and easily break off, or eventually fall out. The gums bleed easily; they are thickened and frequently ulcerated, especially in the neighborhood of the teeth, from which they tend to recede. The soft palate and uvula are thickened and translucent; the increase in weight causes them to press upon the base of the tongue and impairs their mobility. The mucous membrane

of the nasal cavities, anterior and posterior, and that of the pharynx is also tumefied. Stubborn stomatitis with copious salivation and erosions and tumefaction of the laryngeal and tracheal tissues are sometimes observed and may cause death from suffocation. (Zielewicz, R. Kirk.)

The œsophagus, stomach, and intestines are also more or less infiltrated, gastro-intestinal disorders being thus induced, while the same changes in the rectum may give rise to obstinate constipation (Ord, Combe). The appetite is poor; the patient dislikes meat and is never thirsty (Pel).

Epistaxis and bleeding at the gums, especially after the extraction of a tooth or as a result of slight injury, may prove severe. Intestinal and uterine hæmorrhages are also encountered, and may be quite profuse. Cerebral hæmorrhage is occasionally observed.

Case of hæmorrhagic tendency in connection with the disease, the bleeding occurring from the lungs between menstrual periods. Maw (*Jour. of Laryn.*, June, '88).

Three cases in which the tendency to hæmorrhage showed itself by frequent hæmoptysis. Arthur Davis (*Lancet*, Jan. 14, '88); Laycock (*Lancet*, Feb., '88).

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Hæmorrhagic myxœdema with contractures, a new disease. The onset is sudden, with high fever, malaise, vomiting, headache, and the rapid appearance of typhoid phenomena, with great agitation at night. The delirium is often violent. The temperature-curve divides itself into three periods: 1. Rapid rise of the temperature to 39° C., the temperature remaining between 39° C. and 40° C. for from eight to ten days. 2. Apyrexia or even hypothermia for eight days. 3. The temperature again rises to 39° C. During the disease there is a general contracture of the muscles, especially those of the face and neck and

the muscles of mastication. The skin becomes "malleable" like soft wax, and subcutaneous hæmorrhages in the form of ecchymoses, surrounded by a white, painful zone, appear in the third period of the disease. There is absence of meteorism and rose spots. The disease lasts from three to four months. The prognosis is grave. The cause has not yet been discovered. De Brun (*La Presse Méd.*, May 13, '96).

Speech, owing to the tumefaction of the mucous membrane and the general infiltration of the oral structures, is difficult. The motions of the palate, tongue, and lips being impeded, enunciation is imperfect, jerky, and explosive; the nasopharyngeal lumen being reduced, the voice is nasal, though at times the vocal sound is suddenly emitted through the nose. The vocal resonance is hollow, coarse, and leathery in tone. In women the voice may also be lowered in pitch and masculine.

The external genitalia are generally tumefied and the umbilicus sometimes projects as if it were a hernia.

The hair is lustreless, breaks easily, and assumes an appearance of coarseness and "fuzziness." It soon falls out, yielding easily to the traction accompanying the use of the comb. The brows, the lashes, and the hair of the remainder of the body may also gradually be lost. The nails are brittle and thin, and occasionally undergo complete atrophy.

Muscular weariness and exhaustion upon slight exertion form a marked symptom, though considerable strength may be temporarily shown, as in Charcot's case, the patient being capable of easily raising a sack of potatoes several feet. The head is supported with difficulty by the muscles of the neck, and when raised falls forward or backward with suddenness. The patient stands with difficulty and seems always about to

fall, muscular quivering attending certain movements. A fibrillary tremor is often noticed. Paralysis is observed in about 9 per cent. of the cases.

The statistics of the Clinical Society of London show that in 109 cases of myxœdema there were only 14 cases of paralysis. Codd (*Brit. Med. Jour.*, May 4, '95).

Sensation is more or less diminished in intensity, especially where it is usually most delicate. The usefulness of the fingers is thus greatly reduced, touch becoming blunted and the motions of the joints stiffened. Small objects are held with difficulty and frequently dropped, such small articles as pins and buttons being hardly felt. When the tumefaction of any region disappears, the sensibility returns.

Smell and taste are perverted, the patient complaining of foul odors when none exist or of sweet taste where none is warranted. Bitterness or acidity may also be anomalous features of the sense of taste.

The patient is often irritable and impatient, and may become violent late in the course of the disease. Fixed ideas are frequently noted, especially those involving suspicion. The attendants and friends are usually the main objects of the patient's mental perversions, their actions and words being misinterpreted. Though the patients are generally harmless to others, they may, through dread, inflict injury upon themselves. Headache is frequently complained of.

Delusions and hallucinations occur in nearly half the cases, generally when in an advanced stage. Insanity occurs in nearly the same proportion of cases: acute or chronic mania, dementia, or melancholia. Tremors and contractions of the hands and feet, similar to those observed in monkeys after removal of the thyroid, noticed in some cases. (Re-

port of a Committee of the Clinical Society of London on Myxœdema, '89).

In nine cases sent to an asylum the mental symptoms varied widely, embracing simple and suicidal melancholia and various forms of mania. All the cases began with slowness of mental action and lethargy. There was generally an acute period, succeeded by a condition closely resembling a mild dementia with delusions. Clouston (*Brit. Med. Jour.*, Aug. 26, '93).

A prominent symptom is mental torpor or slow intellection; apathy characterizing any effort in which the mind is used is sometimes only marked when the patient is first spoken to, however; in such cases, mental action, once started, seems to be arrested with difficulty; the patients talk with more than normal volubility. Speech may become animated and violent under the influence of anger (Thaon). The memory is usually very defective.

Vertigo is sometimes complained of, and the patient may fall when his eyes are closed. Locomotion is tentative, sometimes waddling, missteps being frequent and sometimes induced by slight obstacles. The ataxic gait has also been noted by Hammond. The motions of the arms are also unsteady and uncertain.

The oral or rectal temperature is lowered from 1° to 3° F. when intercurrent affections involving pyrexia are not present. Cold produces its usual effects more readily than in normal individuals, the extremities and the lips becoming blue under the influence of slight cold. The sensation of cold is not experienced, however, owing to the diminished sensitiveness of the skin.

The flow of urine is decreased, and its specific gravity is usually about 1010. The proportion of urea excreted is sometimes reduced to less than one-half of the normal ratio. Albuminuria may occur as a result of the pressure due to infiltration

of the tissues surrounding the tubules and Malpighian bodies; hence only when the disease is somewhat advanced. Glycosuria has also been observed in some cases. Tissue metabolism is markedly reduced, as shown by the decrease of urea and uric acid in the secretions.

The abdominal viscera, heart, liver, lungs, etc., do not seem to be involved in the process, unless some intercurrent disease of either of them appears. The lungs, however, are especially liable to tuberculosis.

The duration of myxœdema when untreated varies from six to twenty years (Combe). It is characterized by periods of amelioration sometimes of considerable duration, after which the patient relapses into his former state—with perhaps slight increase in the intensity of the symptoms. These exacerbations occur more or less frequently and the patient finally dies of exhaustion. This termination of the disease is infrequent, however, the patient being usually carried off by an intercurrent affection.

ANOMALOUS FORMS.—All the main symptoms enumerated may suddenly appear as a temporary complication of goitre. This acute form of myxœdema may also present symptoms of toxæmia and sometimes proves promptly fatal. In a case reported by Lloyd the disease lasted only a few days.

Literature of '96-'97-'98-'99.

Case of acute myxœdema, with tachycardia, glycosuria, melæna, mania, and death, showing that acute myxœdema may occur as a temporary condition in goitre, giving rise to a group of symptoms which, so far, seem not to have been recorded. It seems most rational to suppose that in this case there was a perversion of the function of the thyroid gland, resulting in a toxæmia, which presented some of the features of myxœdema and some of Graves's disease

with mania. Osler (*Jour. of Nerv. and Mental Dis.*, Feb., '99).

Again, there are cases in which but a limited number—even two or one—of the symptoms enumerated appear. The menopause, according to Chantemesse and Marie, is an instance of the anomalous form, and due to the abnormal manner in which the functions of the thyroid gland are performed during this period.

The etiological influence of antecedent disease in the patient, especially infectious disorders, is marked. Rheumatism, erysipelas, malaria, and tuberculosis are frequently cited among the morbid antecedents, but they seemed sometimes to immediately precede the development of the disease (Combe).

Differential Diagnosis.—When all the main symptoms outlined are present, diagnosis is not difficult; the increase in bulk, the hard swelling, the dryness and roughness of the skin, the mental apathy, the loss of hair, the peculiar yellowish color, and the hypothermia are quite characteristic. In some cases, however, but a few of these signs may be present.

EXOPHTHALMIC GOITRE.—This disease may precede myxœdema, and its symptoms may therefore appear along with those of the latter malady. Individually, however, exophthalmic goitre differs so markedly from myxœdema as to render an error unwarranted.

NEPHRITIS.—The œdema of this affection is most marked in the face and dependent parts. There is pitting on pressure, which is not the case in myxœdema. The skin is not scaly and dry and the nutrition of the hair is normal. In nephritis the patient is normal mentally.

In myxœdema the swelling affects the forehead, the upper as well as the lower eyelid, the bridge of the nose, the lips, and tongue, differing from acute nephritis; it is most intense over the mas-

seters and in the supraclavicular spaces, which are rarely affected in nephritis. In granular kidney the œdema only affects the ankles and legs after standing, and is not very well marked. In myxœdema there is usually depression of temperature, which is rare in nephritis and other diseases; this is also accompanied by a subjective feeling of cold. M. Allen Starr (*Med. News*, Dec. 15, 22, '94).

Literature of '96-'97-'98.

The character of the œdema is entirely different from that encountered in nephritis; it does not pit on pressure, and cannot be removed by massage. Especially characteristic of myxœdema is the swelling in the supraclavicular region noted by Hilton Fagg in cretins. The stupid cretinoid appearance of patients with myxœdema is characteristic. S. J. Meltzer (*Med. Age*, Mar. 10, '96).

[As pointed out by Osler, too much stress should not be laid upon the supraclavicular swellings, since fatty enlargements are sometimes observed in this situation in healthy individuals: the pseudolipomata of Verneuil. CHARLES E. DE M. SAJOUS.]

There are instances in which the diagnosis is by no means easy. Case of a married woman, aged 44 years, with 10 children, who had always had excellent health. Ever since puberty she had a tendency to swelling of the feet, particularly at night. For a year or more she had been getting pale and heavier, the face a little swelled and flabby, and the eyelids œdematous in the morning. Pale-yellow, very muddy complexion; skin dry; but the broad features characteristic of the myxœdematous facies absent. No folds of skin on the forehead; neck not swelled; no large supraclavicular pads; the thyroid gland could be felt. Legs swelled, particularly below the calves. No pitting as in ordinary œdema. No change in voice. Very despondent and low-spirited. Pulse, 70; no increase in tension. Temperature, 98.5°. Amount of urine normal; color also; specific gravity, 1017; trace of albumin; no tube-casts. Case regarded as one of Bright's disease, but suggestive of myx-

œdema. Under thyroid extract marked improvement. If she omits it for a few weeks the swelling returns. Her disposition became quite natural again, and has remained so. William Osler (*Montreal Med. Jour.*, Feb., '97).

Etiology.—Myxœdema was at first believed to be limited to women, but the statistics of the Clinical Society Commission added to those of Hun have shown that it was also prevalent among men to the extent of about 25 per cent. The predilection of women to the disease was ascribed by the latter author to the fact that the thyroid, being functionally more active, is more liable to degenerative changes. Among the 95 women recorded in his statistics, 64 were married and had had 300 children and 29 abortions. Disorders of menstruation attended by copious and repeated hæmorrhages are also thought to act as predisposing factors.

Cold and damp seem to predispose the organism to the development of myxœdema, while cases have been known to recover by a change of residence to a warm country (Charcot). On the other hand, exacerbations of the disease seem to be associated with the approach of winter (Morvan), and cold is notably unfavorable to the progress of the affection at any time. It has been observed in countries typifying the various climates, including Italy and Spain, but England is by far the country in which it is most frequently met with.

Heredity seems to bear some influence in the production of myxœdema. Cases in which symptoms distinctly suggested the existence of myxœdema in parents have been reported by Taylor and Ridet-Saillard. Parental alcoholism, neuroses, tuberculosis, cancer, arthritism or its manifestations, asthma, rheumatism, etc., have also been found to an unusual extent in the history of the cases reported.

In at least 10 per cent. of the cases collected that occurred in men several seemed to be hereditary. A certain number were preceded by hypertrophy of the thyroid, which disappeared later. Ord (Med. Rec., Sept. 13, '90).

Case of myxœdema coming on after long-continued use of iodide of potassium for another affection. Such a sequence is interesting, considering the supposed virtue of iodine in some form in thyroid enlargement. A. M. Stalker (Lancet, Jan. 10, '91).

There is strong evidence that myxœdema, sporadic and endemic cretinism, cachexia strumipriva, and the operative myxœdema of animals are severally species of one genus, and that the one pathological factor common to all these conditions is the occurrence of morbid processes or of operations involving the annihilation of the function of the thyroid body. Ord (Report of a Committee of the Clinical Soc. of London on Myxœdema, '89).

Literature of '96-'97-'98.

Case of myxœdema in a man, aged 36 years, in whom the administration of potassium iodide, 10 grains, to relieve some sacral pain, caused dangerous symptoms. The lymphatic glands of the neck were swelled, the eyelids were œdematous, and the patient complained of a sensation of impending dissolution. The symptoms subsided in two days. Potassium iodide might possibly have accelerated the progress of an incipient myxœdema. Connal (Glasgow Med. Jour., Oct., '98).

Violent emotions and sorrow have been adduced as prolific etiological factors by Pel.

Pathogenesis.—Complete removal of the thyroid gland, as previously stated (see ANIMAL EXTRACTS, volume i) is followed by symptoms similar to those observed in myxœdema: a fact first recorded by J. L. Reverdin, of Geneva. On the other hand, the internal administration of thyroid extract, as is well known, promptly causes the symptoms of this

disease to disappear. That myxœdema, therefore, is due to suppression or impairment of the functions of the gland seems obvious.

Literature of '96-'97-'98.

With very rare exceptions there is discoverable a well-marked atrophy of the thyroid. About this all pathologists are agreed. I can find no example of autopsies upon cases diagnosed clinically as myxœdema in which the gland was found normal or but little affected. J. George Adami (Trans. Congress Amer. Phys. and Surgs., May 4-6, '97).

Myxœdema in common with sporadic cretinism of children and cachexia strumipriva is dependent on a loss of function of the thyroid gland. Ord (Brit. Med. Jour., Nov. 12, '98).

Such being the case, the etiological factors enumerated should in reality be considered in the light of agencies capable of inducing morbid changes in the gland itself, which changes constitute the primary subjective feature of each case. Myxœdema thus becomes a symptom-complex resulting from impairment of the functions of the thyroid gland through local disease.

[This is the only conclusion warranted by our present knowledge, all other conceptions of the pathogenesis of the disease failing in one direction or another.

A few of the theories advanced, however, satisfied many of the obscure features of the disease. Hadden based on the diminution of the urea ratio and the hypothermia the theory that the vasomotor system was mainly at fault. This view was sustained by Morvan, who attributed the paralysis and œdema mainly to the influence of cold and damp, a neuroparalysis being the primary morbid condition. Prolonged lymphatic angiospasm was supposed by Hadden to prevent the return of various elements into the circulation. Connective-tissue changes, reduction of the urea and uric-acid elimination thus became a normal result, with nervous manifestations and hypothermia as attendant symptoms and

atrophy of the thyroid as one of the main sequels.

Henrot attributed myxœdema to hypertrophy of the pituitary body and of the pineal gland involving secondarily the sympathetic, this theory being based upon Tiedemann's view that the pituitary body affords an anastomosis between the two main neighboring ganglia of the sympathetic, and upon the fact that in reptiles and fishes, in which mucous tissue abounds, the pineal gland and pituitary body are markedly developed. The cutaneous infiltration with mucin was thus explained. This is, to a degree, sustained by the cases of J. Stewart, alluded to by Adami, in which autopsy disclosed a large cancerous tumor of the pituitary, the thyroid being normal. But the only manifestation of the disease seems to have been a myxœdematous swelling of the hands and of other regions to a less extent. Goodhart accounted for all the nervous and mental manifestations by supposing the existence of a cerebral lesion, the nervous elements undergoing changes corresponding to those observed elsewhere in the organism. Charcot gave the disease the name of *cachexie pachydermique*, under the belief that it bore a certain kinship with elephantiasis due to impaired nutrition of the nervous system. All these conceptions found many able supporters.

The most prominent and perhaps the only dissentors from the prevailing views in respect to the physiological effects of athyroidism are Professor Munk, of Berlin, and R. H. Cunningham.

Munk (Virchow's Archives; Ther. Gaz., Jan. 15, '98) absolutely denies that the removal of the thyroid in animals either necessarily causes death or inevitably leads to myxœdema, having never seen myxœdema develop in animals. He contends that the feeding of thyroid or the ingrafting of the removed gland into another part of the body never lessens the dangers of thyroidectomy, which always remains a serious operation. He kept a number of animals alive after the operation, and has been successful in the case of apes that have survived, and are in good health nearly a year after the

careful, complete, but thoroughly aseptic, removal of the supposedly absolutely essential thyroid. This view coincides with that of Lanz (Boston Med. and Surg. Jour., Oct. 17, '95), who saw in thyroidism two component causes: (1) a poisoning from absorption of putrid material; (2) a specific effect of the thyroid gland *per se*.

Cunningham (Jour. of Exper. Med., No. 2, p. 147, '98) after a careful review of the literature and a series of experiments, argues that the symptoms of induced thyroidism are manifestations of an intoxication resulting from the ingestion of decomposed thyroid material. The so-called experimental thyroidism is not, he contends, specific for the thyroid only, for the ingestion of many substances derived from animal tissues other than the thyroid gland may produce an intoxication strikingly similar in every respect to that of experimental thyroidism.

While the toxic effects noted might furnish some ground for Cunningham's views, he will find it difficult to explain how this decomposed thyroid material can, administered therapeutically, cause the disappearance of morbid conditions and all the symptoms attending myxœdema. CHARLES E. DE M. SAJOUS.]

In all cases in which the diagnosis of myxœdema was unmistakable, and in which the thyroid, or what remained of it, was histologically examined, its functions were found markedly compromised by local morbid processes of various kinds. Adami, in a study of the literature of the subject, ascertained that in the majority of cases the atrophy was "peculiarly extensive, the specific cells of the gland being replaced by fibrous tissue." In some, less advanced, there were not only degenerated remains of vesicular epithelium, "but of vesicles which by the superabundant proliferation of their epithelium would seem to be undergoing a compensatory hypertrophy,"—an effort to restore a function exemplified in other directions.

Among the disorders to which atrophy of the thyroid have been traced, according to Combe, are acute articular rheumatism (Hadden), erysipelas (Mendel), syphilis (Koehler, Pospeloff), and actinomycosis (Koehler). To this list may be added malignant neoplasms, several instances of which have been recorded.

Acute inflammation of the thyroid may induce infantile myxœdema, followed in turn by more or less complete atrophy of the gland. It is therefore probable that a certain proportion of myxœdema in the adult could be traced to this cause.

Literature of '96-'97-'98.

Case of cretinism following an attack of acute thyroiditis. The child was well and normally developed until 10 months of age, when she had the attack of acute thyroiditis. The latter lasted about a week; was accompanied by fever, swelling of the thyroid, and symptoms of pressure on the trachea. The throat was normal in appearance on the inside. There was no abscess-formation; the swelling and fever disappeared with complete atrophy of the thyroid. The child's growth and development ceased immediately after this attack, and she developed the usual appearance of a typical cretin. Treated for a short time with thyroid extract with marked improvement. Edmund Shields (N. Y. Med. Jour., Oct. 9, '98).

Myxœdema is a symptom or combination of symptoms of loss of the function of the thyroid gland. In the idiopathic form it is a symptom of chronic interstitial thyroiditis, just as anasarca may be a symptom of renal disease or ascites of hepatic disease. G. R. Murray (Brit. Med. Jour., Feb. 8, '96).

[It is possible that the thyroid enlargement reported as preceding myxœdema in some cases would be found to have been due to a thyroiditis occurring in arthritic individuals. As stated under ETIOLOGY, a proportion of cases of myxœdema show an ancestral history of rheumatism, asthma, etc., and other

manifestations of arthritism. CHARLES E. DE M. SAJOUS.]

Thyroidal fibrosis is sometimes preceded by exophthalmic goitre.

Literature of '96-'97-'98.

Case of a female in whom, at the age of 17, was noticed enlargement of the throat and prominence of the eyeballs, with hurried, jerky manner both in speech and movements. This condition seems to have persisted to the age of 21, when with the appearance of the catamenia the health became normal. Within a year of this symptoms of myxœdema supervened, and when seen at the age of 26 the latter were well developed and the thyroid gland imperceptible. A normal state of health returned after five months' treatment with dry sheep's thyroid.

The patient's paternal grandfather and paternal aunt, her maternal grandfather, and two uncles had died of "dropsy." Her father had died of endocarditis; one of two brothers suffered from rheumatism and alopecia. T. F. Hugh Smith (Brit. Med. Jour., Jan. 4, '96).

In certain well-observed cases the symptoms presented before the establishment of myxœdema have been more or less the symptoms of exophthalmic goitre. It appears to me probable that we shall recognize in the near future more and more the occurrence of a stage of hypertrophy of the thyroid gland with or without the signs of Graves's disease as an antecedent of myxœdema. William M. Ord (Brit. Med. Jour., Nov. 12, '98).

Atrophy of the thyroid gland being accepted as the primary factor, how are the morbid changes in the various organs involved in myxœdema brought about?

That we are dealing with the results of inhibited physiological function is sustained on all sides.

Literature of '96-'97-'98.

Where glands afford an internal secretion the development or non-development of symptoms of disease depends

primarily upon the relative amount of internal secretion produced and of the substance or substances acted upon by the same. J. George Adami (*Trans. Amer. Phys. and Surgs.*, vol. iv, p. 115, '97).

The thyroid tissues, as shown by Baumann, contain a substance, thyro-iodine, that is unaffected by boiling, strong acids, or gastric digestion, and which, when absorbed into the general organism through the blood- or lymph- channels, counteracts all the symptoms of myxœdema, or "thyroidism." The precise effects of this substance is not as yet positively known: either it antagonizes noxious products of metabolism or it so enhances metabolic interchanges as to keep them to a normal standard.

The latter view is the prevailing one, though the predilection for certain tissues—the skin, the nervous system, etc.—remains unexplained. Still, many anomalous manifestations attending the therapeutic use of thyroid would thus be accounted for. The gouty and rheumatic manifestations—noted particularly by Crary, Witherstine, Harris, and Wood, for instance—would normally be ascribable to a sudden onslaught of uric acid and other products of metabolism into predisposed regions.

Literature of '96-'97-'98.

Case of a man who, immediately after he was put on thyroid extract, had a typical attack of gout, which subsided when the extract was stopped, and reappeared when the extract was again administered. The last previous attack of gout had been three years before. The thyroid extract, by producing increased metabolism, might account for the attack of gout, despite the fact that usually in myxœdema the amount of urea excreted is largely increased by the use of thyroid preparations. Patients taking thyroid preparations complain of a good deal of pain in the back or limbs: it is worthy of consideration whether

those pains might not be of a gouty nature. Thomas Harris (*Brit. Med. Jour.*, Feb. 15, '96).

Again, the growth of hair, the increased assimilation of fat, the improved appetite with increased absorption of nitrogenous foods, the skeletal growth, and the general improvement of nutrition witnessed when thyroid is used remedially remain unaccounted for if it is the thyroid gland's function to eliminate toxic products of metabolism.

The group of symptoms "indicating in various ways impairment of the functions of the nervous system, such as slowness in muscular movement and tardiness in response to impressions made upon the surface of the body, slowness in thought and action, weakening of memory, etc.," Ord attributes in part to alteration in and around nerve-endings, due mainly to pressure of the connective tissue and the alterations in the latter. That this view is based on good ground seems probable, though it fails to account for the complete (though not final) recovery witnessed in even advanced cases.

Results of the examination of the brain in a typical case of myxœdema with marked mental symptoms: Brain slightly œdematous; slight, diffuse, atrophic condition of the convolutions. Sections taken from a point one inch from the upper end of the ascending frontal convolution showed a marked abnormality in the nerve-cells, consisting of a tendency to distortion and diminution of the number of processes. The nuclei were inflated, distorted, and vacuolated. In some cases the cells had disappeared, leaving only the distorted nucleus. This condition might account for some of the mental, motor, and sensory phenomena of the disease. J. R. Whitwell (*Brit. Med. Jour.*, Feb. 27, '92).

Treatment.—The treatment of myxœdema by thyroid extract, the only remedy that has proved efficacious, is given

in detail in the article on ANIMAL EXTRACTS (volume i), and the reader is therefore referred to that section.

Murray in a recent paper (Lancet, Mar. 11, '99) stated that he had found the liquor thyroidei (now official in Great Britain) preferable to the dry extracts. From $\frac{1}{8}$ to $\frac{1}{4}$ of a lobe of sheep's thyroid represents about 10 minims of the liquor. Being prepared from a large number of glands, its strength is uniform. The dose recommended—5 to 10 minims—he prefers to administer in a single daily dose at bed-time.

[This is a wise precaution, since the deleterious effects are most likely to occur during active exercise. I have seen two cases, in which I have administered thyroid extract (for disorders other than myxœdema) in 2-grain doses three times daily, suffer from attacks of vertigo and syncope, which only occurred while the patients were walking or climbing stairs without undue exertion.

Dr. Murray was led to realize the import of great care by painful experience in two cases, in which death occurred from syncope. The patients suffered from cardiac disease, and the fatal results had been brought on owing to too early exercise after prolonged treatment for myxœdema. CHARLES E. DE M. SAJOURS.]

Great caution is required in the use of this potent agent. Murray particularly warns against its reckless use in cases showing symptoms of degeneration, particularly when attacks of syncope, dyspnoea on exertion, feeble or irregular pulse, or weak heart-sounds are elicited by the examination. Under these conditions the patient should be confined to bed at first and only small doses of from 3 to 5 minims of the liquor thyroidei (equal to about 1 to 3 grains of our extract) given each night. This dose he found to be well borne and may gradually be increased to 10 minims. Unless confined to bed, the cases are apt to

ignore their cardiac weakness and utilize their returning vigor too early, thus imposing upon the heart labor before it has had time to adapt itself to the altered conditions brought about by the treatment. Any undue acceleration of the pulse, up to 90 or 100, indicates a reduction in the dose, and any signs of cardiac failure must be met by stimulants and digitalis.

[Doubtless this advice is based upon Dr. Murray's experience, and should be followed. Still, it does not appear to me to be sustained by the prevailing theory as to the physiological rôle of the thyroid. If, when administered remedially, it also stimulates metabolism, the cardiac complications are the result of overstimulation. If such is the case, digitalis and stimulants would apparently increase the danger. On the whole, the necessity of precautionary measures in the use of the remedy is all the more emphasized. CHARLES E. DE M. SAJOURS.]

Myxœdema being due to the absence of some thyroïdal principle possessed of physiological functions, it is obvious that the use of thyroid as a remedy must be continued after a cure is obtained. Small doses are sufficient to preserve health, and recurrence may be predicted unless these are taken.

Next in importance to thyroid extract is warmth. Patients are invariably improved by warm weather, and this indication should be taken as guide in respect to dress, bed-covering, etc. Warm baths have also proved very beneficial.

Various remedies—quinine, strychnine, iron, ergot, etc.—were employed before the use of thyroid extract was proved curative by Murray; but, as they were practically useless, even their enumeration seems superfluous.

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Philadelphia.

MYXOMA. See TUMORS.

MYXOMATA, NASAL. See NASAL CAVITIES.

MYXOSARCOMA. See TUMORS.

N

NÆVUS. See VASCULAR SYSTEM.

NAILS, DISEASES AND INJURIES OF THE.

Besides the implication of the nail in general morbid processes—such as syphilis, neuritis, leprosy, etc.—there are several strictly local divisions that require special notice.

Contusion.

Contusion of a nail by a blow, a compression, etc., is a common occurrence. Unless sufficiently marked to cause destruction of the matrix, such an injury is usually slight, the acute pain experienced at first quickly disappearing. When, however, the traumatism is serious and the nail is torn off, severe suffering is induced, which may persist quite a long time. Again, infection of the exposed tissues may occur, leading to inflammation and suppuration.

TREATMENT.—Slight cases of contusion require no treatment. After a few minutes the pain generally decreases, then ceases, and the ecchymosis that shows through the nail is generally eliminated through the growth of the nail.

In severe cases the finger or toe should be immersed in a saturated solution of borax, then dressed with iodoform—or, preferably, with orthoform—if pain continues. The dressing should be changed every day where a toe is the seat of injury. If the nail is partly torn off, it should be carefully cleansed along with the underlying tissue, replaced, and held in place with a bandage applied over the dressing.

Onychia.

This is an inflammatory disorder of the nail popularly called a “run-around,”

which may follow an injury such as that first described or the introduction between the nail and the underlying tissues of infectious matter, along with a foreign body: a thorn, a splinter, etc. The fingertip becomes warm and congested, and severe pain generally accompanies the local inflammatory process. An abscess is formed after a few days, the pus being evacuated through the aperture formed by the offending body. If none such exists, the nail may become softened and perforated. When the accumulation of pus is marked, there may be febrile and other symptoms denoting general involvement.

Case of Brümische's in which a neglected paronychia gave rise to chills, followed by a purpuric eruption, pain and swelling in the joints, bloody diarrhœa, transitory heart-symptoms, and hæmaturia, which persisted for some months. There was probably an invasion of microbes from the paronychia, from which endocarditis ulcerosa and embolism of the affected organs resulted. J. Levison (*Satellite of the Annual*, Sept., '92).

In the vast majority of cases, however, the symptoms generally become less marked and involution soon follows, sometimes after the loss of the nail. This is always replaced, though not always by as perfect a nail as the one shed.

TREATMENT.—The old treatment by poultices is now supplanted by antiseptic methods that tend to destroy the infectious germs instead of affording them suitable conditions for development. Hot-water baths—as hot as can be borne—sometimes speedily arrest the process. Alcohol acts in the same manner. If a splinter or other infectious body have penetrated the tissues, the pus-cavity can

usually be penetrated without pain with an hypodermic needle and washed out with a 1 to 5000 bichloride solution. Bathing the finger in such a solution at frequent intervals, or, better still, leaving it therein an hour several times a day, sometimes arrests the infectious process early in its career. Whenever there is an accumulation of pus imprisoned, however, it had better be liberated by an incision and washed out with the hypodermic syringe. Peroxide of hydrogen 1 part in 3 is very effective in such cases.

Malignant Onychia.

This is a complication of the disorder just outlined, which may occur in persons who are constitutionally weak or adynamic or in so-called "scrofulous" or lymphatic children. It usually affects the index finger, the thumb, or the big toe, and is the active manifestation of a local ulcerative process in the matrix of the nail. The latter becomes brownish or black, and is shed, leaving underneath a granular fungous mass which shows no tendency to heal. The finger sometimes becomes enormously enlarged and discharges considerable foetid pus. Necrosis of the bone of the phalanx involved occasionally follows.

TREATMENT.—Proper active measures usually prove promptly effective. The nail should be removed with forceps. Pain may be prevented by first injecting a 4-per-cent. solution of cocaine under the nail. The parts are then dressed with iodoform. A day or two later, after brushing the parts with a 4-per-cent. solution of cocaine, the ulcerating area is touched with nitrate of silver or with the tincture of the chloride of iron. This should be repeated, if need be, several times at two or three days' interval. If this prove insufficient, acid nitrate of mercury must be used after anæsthetizing the parts with a 10-per-cent. solu-

tion of cocaine. Such an application may also be rendered painless, according to Randolph, by saturating the nitric acid with the hydrochlorate of cocaine.

Hypertrophy.

Hypertrophy of the nails is usually ascribed to pressure. It may affect the hands, but is met with, in the majority of cases, in the nails of the feet. The thickening may affect any part of the nail regularly or irregularly, a broad raised mass being sometimes the only evidence of the abnormal process. In the majority of cases, however, the hypertrophy is irregular, the epithelial growth being restricted to areas. The nail, under these circumstances, becomes covered or bosselated and simultaneously yellowish gray, opaque, and very brittle. Though the growth is very gradual, pressure upon the underlying tissues causes local disorders, especially if the nail cracks, when painful inflammatory symptoms follow. It produces heat and discomfort when affecting the feet, shoes being worn with difficulty. When the nails of the hands are the seat of the hypertrophy it constitutes quite a deformity.

TREATMENT.—The overgrowth should be filed down or sawed. In other words, measures tending to give the nail its normal shape should be resorted to. All complications are of the nature of those attending the so-called "ingrowing toe-nail" and the treatment given for the latter condition is also applicable.

Ingrowing Toe-nail.

The term "ingrowing toe-nail" is applied to a condition usually confined to the great toe, in which the edge of the nail (almost always the outer edge) is forced into the adjoining soft parts. Swelling of the latter being induced, they overlap the nail, the point of contact becoming the seat of ulceration and

granulations. It is usually due to the pressure of tight shoes, and is therefore generally met with in young adults. It is also frequently encountered in soldiers as the result of prolonged marching with heavy accoutrements that increase the pressure upon the feet. Lymphatic subjects are more liable to it than others, and the affection is exceedingly persistent in them. It often accompanies diabetes and may occur as a complication of febrile diseases of long duration, fractures and other processes tending to debilitate the organism, hyperidrosis, etc., but most frequently as a result of badly-shaped shoes.

TREATMENT.—In mild cases properly fitting shoes giving freedom to the toes, frequent ablutions, and finely-powdered borax or tannin applied to the dressed tissues usually suffice for a cure. The mere daily introduction of cotton under the edge of the nail by gradually raising the latter away from the soft parts is sometimes very satisfactory. Scraping the centre of the nail until it is quite thin occasionally suffices to relieve the pressure.

In the great majority of cases the ulceration requires active measures besides a change of foot-wear. The ulcerated tissues must first be relieved of their granulations. This can easily be done by using the tincture of the chloride of iron after anæsthetizing the parts with a 4-per-cent. solution of cocaine. Or they may be scraped with a curette or gently cauterized with the mitigated stick: oxide of zinc and nitrate of silver. This being done, a small piece of cotton-wool covered with iodoform, iodol, or aristol is gently inserted with a probe into the diseased cavity, the soft parts being raised from the nail. These measures do not always procure a radical cure, however, particularly if the patients again use

narrow or short-tipped shoes. In each case surgical measures are preferable. The simplest of these is to anæsthetize the tissues—or the patient—and, after careful cleansing of the parts, to simply pare off the redundant tissues, granulations and all, on a level with the edge of the nail. The nail-edge being then carefully trimmed, an iodoform dressing is applied. Or the dressed parts may be dissected out and a plastic union obtained by a few stitches.

Simple treatment recommended for ingrown toe-nail. A 40-per-cent. solution of liquor potassa is applied warm to the portion of the nail to be removed. After a few seconds the uppermost layer of the nail will be so soft that it can be scraped off with a piece of sharp-edged glass; the next layer is then moistened with the same solution and scraped off; this must be repeated until the remaining portion is as a thin sheet of paper, when it is seized with a pincette and lifted from the underlying soft parts and severed. The operation does not require more than half an hour's time, and is painless and bloodless. Puerekhauer (*Pittsburgh Med. Rev.*, Feb., '91).

Literature of '96-'97-'98.

In ingrowing toe-nails plaster applied diagonally around the toe in such a manner that the soft parts shall be drawn away from the nail without direct pressure over the latter is sometimes efficient. A semilunar-shaped piece of plaster is better than a straight strip. It should be applied with the convexity forward, one horn beginning just behind the nail on the affected side. This will allow the belly to catch the offending soft parts, while the remainder of the piece is carried around the plantar surface of the toe and over the dorsum, crossing the first end. This dressing should be changed every three or four days. J. L. Andrews (*N. Y. Med. Jour.*, Mar. 20, '97).

The older surgeons used to recommend evulsion of the nail: an operation performed by forcibly inserting a scis-

sors under it; but this measure is now condemned because the new nail is generally a malformed one and hypertrophy (*vide supra*) occasionally follows.

Literature of '96-'97-'98-'99.

In ingrown toe-nail the following method, modified from that advised by Masters, of England, recommended: A flat strip of silver— $\frac{1}{100}$ inch thick, $\frac{1}{8}$ inch wide and 1 inch long—is bent into the shape of a fish-hook. The toe having been cleansed with peroxide of hydrogen and moistened with a solution of cocaine, the hook is inserted under the lateral edge of the nail so that the shank of hook curves over the side of toe and lies close to it. The greater the ulceration, the less the pain in inserting the hook. It is retained in place by adhesive plaster or a bandage. The hook not only protects the flesh from the nail, but it exerts a lifting action on the nail. After a few hours the patient suffers no inconvenience from the hook, and in a few days the swelling subsides and the granulations become more healthy. It is well to wear the hook for several weeks after the tissues have healed. Henry Ling Taylor (*Inter. Jour. of Surg.*, Sept., '96).

All cases of ingrowing nail may be cured without recourse to the knife by proceeding as follows: With a flat probe, or a match, a bit of cotton is slipped between the edge of the nail and the inflamed flesh. Another strip of cotton is put along the outer margin of the ulcerated area, and the space between these two strips of cotton, and which is occupied by the ulcer, is thickly powdered with nitrate of lead. The whole is covered with cotton, and the toe is bandaged. The dressings are repeated daily until the incarcerated edge of the nail is plainly visible. Usually four or five dressings suffice. Then the edge of the nail is lifted away from the flesh and a bit of cotton is introduced under it. As it grows it will gradually take its proper position above the flesh.

The lead is to be discontinued as soon as it appears that the exuberance of the

fleshy bed of the nail has been overcome. The difficulty seldom recurs. If this does happen it is necessary to repeat the treatment from the beginning. Tardif (*Anjou Méd.*, Feb. 1, '98).

Case in which after all usual methods had failed a triangular notch was made midway in the free edge of nail extending to its body. From the pointed margin of this notch a furrow was made, as near to the quick as possible, without penetrating it, through the middle of the root as far as the duplicature of skin; a piece of cork was then inserted under the nail, whose bulk was large enough to extend a few lines on either side of the notch, as well as to compactly fill, without uneasiness, the interspace between the skin and extremity. J. G. MacCullum (*Mass. Med. Jour.*, Jan., '99).

NAPHTHALIN, NAPHTHOL, AND ALLIED COMPOUNDS.—Naphthalin, naphthalene, or tar-camphor, is an hydrocarbon obtained from coal-tar. It occurs in white scales, having a fatty lustre, a strong, coal-tar odor, and a burning, aromatic taste. It is soluble in alcohol and ether, the fixed and volatile oils, and in acetic acid, but it is insoluble in water. It melts at 175° F. It should not give any reaction on moistened blue litmus-paper, and should dissolve in concentrated sulphuric acid, when warmed gently, without color.

Dose.—Naphthalin may be given in doses of 2 to 15 grains in powder or in capsule. The maximum daily dose is 90 grains.

Physiological Action.—Naphthalin is toxic to the lower forms of life, insects, their ova, etc., and is therefore extensively used to preserve clothing from the destructive action of moths, etc. In the human being it temporarily irritates the mucous membrane, but this effect becomes more active when naphthalin is dissolved in oil or alcohol. Internally administered, the urine becomes dark-

ened, showing an irritant action upon the kidneys; an eruption simulating that of measles, and followed by desquamation, has been observed after its use. In animals cataract has followed a continued administration of the drug.

Literature of '96-'97-'98.

Wishing to prescribe naphthalin for a weak, anæmic woman, suffering from chronic enteritis, effect of the drug was first tried personally, 8 grains in water being taken. Very soon the writer was seized with severe colicky pains in the abdomen, followed almost immediately by diarrhœa, tenesmus, and strangury. The motions, which were very numerous and small, were at first fecal, but finally contained a great deal of mucus. Four hours after taking the drug vomiting set in, and continued for about fourteen hours. He could retain absolutely nothing. Toward the end the vomited matter was slightly streaked with blood. About fifteen hours after taking the drug the pain became most agonizing. "It seemed as if a red-hot iron were plunged into the kidneys with every heart-beat." This severe pain lasted for about twenty minutes. During this paroxysm the pulse was very slow, and almost imperceptible at the wrist. The urine which was passed soon after was reddish brown, and contained about 25 per cent. (by volume) of albumin. It also contained a few blood-clots, many granular casts, urates, and mucus.

He continued very ill for five days. Temperature was all the time somewhat subnormal; the pulse was at first 45 per minute, but gradually, toward convalescence, rose to 68 per minute. Relief from pains was obtained by hypodermics of morphine and by leeches over kidneys.

Prominent chemist in England analyzed a portion of the drug and he reported the sample to be above the average degree of purity. Otte (Med. Rec., Apr. 30, '98).

Therapeutics.—The therapeutic action of naphthalin depends upon its antiseptic and antiparasitic properties.

INTESTINAL DISORDERS.—Naphthalin, in 5-grain doses, has been used with apparent benefit in typhoid fever (Wolff), in acute and chronic intestinal catarrh, in fermentative diarrhœa, and in cholera. It diminishes the activity of the intestinal bacteria, as shown by C. Sehrwald, who advises its use in conjunction with calomel. In dysentery 10 or 15 grains may be given in a warm decoction of althæa (marshmallow) by rectal injection.

In the summer diarrhœa of children, $\frac{1}{6}$ to $\frac{1}{4}$ grain may be given every two to four hours.

ANTHELMINTIC.—Naphthalin in doses of 3 to 10 grains, combined with castor-oil and disguised with a couple of drops of oil of bergamot, is useful in treating ascarides (Mirowitch). Seat-worms are best treated by the injection of 10 or 15 grains of naphthalin in 2 or 3 ounces of oil into the rectum. For tape-worm, 15 grains should be given before eating, followed some hours later by a full dose of castor-oil.

In treatment of tape-worm, a single dose of naphthalin usually suffices. After three meals containing excess of salty and vegetable acid food about 20 grains of the drug are administered in capsule; this is followed in four hours by a free dose of calomel with soda, and this in turn by castor-oil. Hard (Cincinnati Med., p. 711, '94).

Naphthalin is an excellent remedy against *Oxyuris vermicularis*. Dose varies from $2\frac{1}{4}$ grains for a child $1\frac{1}{2}$ years old to 6 grains for one of 12 or 13 years. It is best given in powder mixed with sugar or in capsule. A good purge is first given, then 4 doses of the naphthalin are given daily for 2 days, repeated 8 days after the first dose, and again repeated after an interval of 14 days. Schmitz (Jahr. f. Kinderh., B. 39, S. 121).

URINARY DISORDERS.—Naphthalin is recommended for glycosuria. It is

claimed that it diminishes the amount of sugar, even when the patient is using a mixed diet.

Pyelitis and cystitis are benefited through the use of naphthalin. The drug lessens urinary fermentation. Caution should be observed in administering the drug when the glandular tissue of the kidney is diseased. Magnus has observed a dangerous action of the drug upon the renal tissues, accompanied by a darkened color of the urine, while Panas, Dorr, Hess, and Kolinski claim that in large doses it destroys the red blood-corpuscles.

RESPIRATORY DISORDERS.—Chavernac advises the use of naphthalin by vaporization in pertussis. Rossbach commends its use as an expectorant in chronic bronchitis, given in pills, powders, or troches, and for irrigation of the nasal cavities.

Inhalations of naphthalin in fifteen cases of pertussis in children from 4 months to 11 years of age. From $3\frac{3}{4}$ to 5 drachms of naphthalin were used for inhalations, which were repeated four or five times daily. It may be vaporized in any vessel, care being taken to prevent its catching fire. Of the 15 cases 6 took but one inhalation; 5 received no benefit from the treatment; in the 4 remaining cases the attacks ceased after the third day, expectoration becoming easy and only a simple cough remaining. These 4 cases were recent, 1 of them being only of one week's duration and the other 3 of two weeks'. There were no disagreeable effects from the drug. N. Koroleff (Med. Obozrenije, No. 21, '93).

CUTANEOUS DISORDERS.—Scabies is cured by a 10- to 12-per-cent. solution of naphthalin in olive-oil or linseed-oil (Fürbringer). In ointment (5 to 10 per cent.) it is useful in chronic eczema, psoriasis, lepra vulgaris, etc.

As a dusting-powder (with $2\frac{1}{2}$ per cent. of bergamot-oil to cover odor), as spray, or on gauze it is useful in the treatment of abscesses, ulcers, and suppurat-

ing wounds. It is also a good dressing for recent wounds. Dusted into the shoe or stocking, it has been found useful in hyperidrosis of the feet.

In treatment of insect-bites, rubbing the parts every few hours with 2 or 3 drops of saturated solution of naphthalin in liquid vaselin recommended. V. Pedkow (Med. Obozrenije, No. 24, '93).

Literature of '96-'97-'98-'99.

Naphthalin employed in a variety of cutaneous and venereal diseases. It does not stain linen. Mixed with olive-oil and gum arabic it forms an emulsion with water, and is completely soluble in chloroform and ether, and slightly so in oil. 1. In all forms of eczema, except in the most acute stages, naphthalin is an excellent application. It is especially useful in chronic and traumatic eczema. 2. In psoriasis improvement always observed. 3. It has a reducing action of nearly the same intensity as ichthyol and sulphur, and may be tried in all cases where these are applicable. 4. It is a useless application in soft and hard chancres and in gonorrhœa. 5. Rectal suppositories containing from 5 to 10 per cent. of naphthalin seems to have a favorable influence on catarrhal prostatitis. Rohleder (Monats. f. prakt. Derm., B. 27, '98).

Naphthalin possesses very great therapeutic powers in promoting the healing of extensive sores and ulcers of the skin, especially chronic ulcer of the leg.

The beneficial effects are usually marked after the first week of treatment, being manifested by the diminution of the discharge, the change in aspect of the ulcer, and by new granulations.

Following method of application recommended: A piece of cotton-wool corresponding to the size of the ulcer is first dipped for a few minutes in an antiseptic lotion, then covered with naphthalin and applied to the sore parts; over this a piece of gutta-percha tissue is placed and the whole secured by a bandage, care being taken that the parts previous to application have been carefully cleansed. At first the bandage is changed after eight or ten days; later

it may be left for a longer period. H. J. Takowlew (Vratch, Feb. 4, '99).

Naphthol.

Naphthol (naphtol, U. S. P.), isonaphthol, or betanaphthol, is a phenol occurring in coal-tar, but usually prepared artificially from naphthalin (naphthalene). During the process of manufacture two naphthols are formed, the official naphthol being the first to crystallize and being readily separated from the alphanaphthol by boiling alcohol, the latter being insoluble in it. Alphanaphthol is considered to be one and a half times as strong as regards its antiseptic and germicidal powers, but it is not often used internally.

The physiological action, dose, and therapeutic uses of naphthol are practically the same as those of naphthalin. Betanaphthol enters into combination with a variety of bases and acids, the resultant compounds having an added antiseptic action.

Betanaphthol employed in 131 cases of enteric fever, with 14 deaths. Kirchberg (Gaz. des Hôp., Sept. 11, '94).

Use of betanaphthol recommended as a vaginal antiseptic. Following solution may be used:—

℞ Betanaphthol, 4 drachms.
Alcoholis, 30 drachms.

A teaspoonful is added to a quart of water, which has been previously boiled and filtered, and used as a vaginal injection, either hot or cold, as the case may require. Sunar (L'Union Méd., Feb. 29, '92).

Alphanaphthol and betanaphthol have about the same power of restraining the growth or destroying the vitality of the comma vibrio. In the proportion of 1 in 16,000 they restrain the growth; in that of 1 in 3000 they kill in 2 hours; in that of 1 in 2000 in 5 to 30 minutes. Resort to these drugs recommended as preventives, and in the treatment of the early stage, of cholera. From Sternberg's data it is calculated that entire small in-

testine is proof against the introduction of the vibrio, and that under similar conditions 40 grains would be germicidal. The maximum daily dose of either naphthol is commonly placed at 1 drachm, but much larger quantities may be given, as the toxic dose for a person weighing 143 pounds is said to be $8\frac{3}{4}$ ounces. Betanaphthol is to be preferred as a prophylactic, and 5 to 10 grains, finely pulverized and mixed with white sugar, may be taken three to four times daily. In early choleraic diarrhœa similar or larger doses recommended at shorter intervals. D. D. Stewart (Amer. Jour. Med. Sci., Apr., '93).

Literature of '96-'97-'98.

Conclusions in regard to use of betanaphthol in the treatment of cutaneous diseases: 1. Betanaphthol proved decidedly useful in scabies. 2. Betanaphthol cured tinea circinata in a short time, but did not give as good results in other forms of ringworm. 3. Betanaphthol was a good antipyretic. 4. Betanaphthol has very decided stimulating qualities. 5. Betanaphthol proved of more service in chronic inflammations of the skin. J. Abbott Cantrell (Amer. Ther., Mar. 14, '96).

For intestinal antiseptic alphanaphthol is superior to betanaphthol. It has three times the antiseptic power of the latter, and exhibits only one-third its toxic properties. Maximowitsch (Med. News, Jan. 15, '98).

Asaprol, or **abrastol**, is the sulphuric ether of betanaphthol. It occurs as a white powder, freely soluble in water and alcohol. It has antiseptic, analgesic, and antipyretic properties, and is valuable in acute inflammatory rheumatism, in doses of 5 to 15 grains several times daily.

Benzonaphthol, or benzoyl-naphthol, a combination of benzoic acid and betanaphthol, occurs as a whitish powder which darkens with age. It is soluble in alcohol, but not in water. It is antiseptic and diuretic in doses of 4 to 8 grains. With equal doses (2 grains) of bismuth

salicylate and $\frac{1}{2}$ grain of Dover's powder it has been recommended by S. Solis-Cohen in cases of infantile diarrhœa.

Iodonaphthol, or di-iodide of betanaphthol, is a combination of iodine and betanaphthol. It occurs as a greenish-yellow, tasteless and odorless powder, soluble in chloroform; slightly soluble in alcohol, ether, and acetic acid; and insoluble in water. It has been used chiefly as an antiseptic dusting-powder on wounds and ulcers.

Lactonaphthol, or lactol, a combination of lactic acid and betanaphthol, is used chiefly as an intestinal antiseptic. Fifteen grains may be given daily in divided doses.

Microcidin, or sodium naphtholate, a combination of caustic soda and betanaphthol, occurs as a yellowish-gray or white powder, soluble in 3 parts of water. It is used in solution (3 to 5 parts per 1000) as an antiseptic and germicide in diseases of the ear, nose, and throat and as a surgical antiseptic for bandages, etc., in 3- to 5-per-cent. solution.

Naphthol-aristol, or di-iodo-betanaphthol, occurs as a yellowish-green powder without odor or taste. It is insoluble in water, soluble in chloroform, and slightly soluble in alcohol and ether. It is used as an antiseptic instead of aristol.

Naphthol-bismuth, or bismuth betanaphtholate, occurs as a light-brown insoluble powder, without odor. It is used internally as an antiseptic in affections of the intestines, like salol, in doses of 15 to 30 grains.

Naphthol-camphor, or camphorated betanaphthol, occurs as a clear, brown, syrupy liquid, soluble in alcohol. It is composed of naphthol, 1 part, and camphor, 2 parts, and is recommended as an application for tuberculous affections, and when mixed with oil for ozæna, coryza, scabies, and furuncles.

If 2 parts of camphor be heated with 1 part of betanaphthol, there results a liquid which will dissolve the fixed and volatile oils, the alkaloids, and iodine. Désequelle (Provincial Med. Jour., Sept., '89).

Salinaphthol, betol, naphthalol, or betanaphthol-salicylate, a combination of betanaphthol and salicylic acid, occurs as a white powder without odor or taste, soluble in boiling alcohol and ether, but insoluble in water and glycerin. It is used as an internal antiseptic, antizymotic, and antirheumatic, in doses of 4 to 8 grains, in wafers, milk, or emulsion, four times daily.

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NASAL CAVITIES, DISEASES OF.

Acute Rhinitis (Acute Coryza).

Acute rhinitis is divisible into *acute catarrhal rhinitis* and the more unusual forms of *acute purulent* and *croupous rhinitis*.

Acute Catarrhal Rhinitis.

Symptoms.—The onset of a cold is marked by local symptoms and a general reaction, which does not differ in kind from that which accompanies local inflammations in general, embracing lassitude, chilliness, myalgia, and more or less fever. The local symptoms comprise a stage of dryness accompanied by sneezing and followed by a profuse discharge, at first watery and later muco-purulent. Of collateral symptoms there are: nasal voice, impairment of the sense of smell, and especially obstruction of one or both sides of the nose, this latter phenomenon being due to the turgescence of the erectile tissue of the turbinated bodies.

If the nostrils are examined during an attack of acute catarrhal inflammation the entire mucous surface will present a vivid red appearance; the inferior turbinated structures are engorged with

blood and in contact with the swelled septum. This congestion is usually not so intense in the posterior part of the nasal passages. The secretions are at first serous, later mucous, and finally become muco-purulent.

Etiology and Pathology.—Acute catarrhal rhinitis, or coryza, may be excited alike by exposure to cold and draughts, by various inhaled substances which may act either chemically or mechanically, by certain ingested substances which are eliminated through the nasal mucosa (iodine), and finally by specific bacterial poisons in the course of general infectious processes, such as measles, scarlet fever, influenza, etc. With the exception of this latter subdivision there is no class of cases of catarrhal rhinitis in which the likelihood of bacteriological causation can be demonstrated.

The coryza which accompanies specific fevers is undoubtedly in some cases purulent, however, and due to the usual exciters of suppuration.

With regard to the part played by various fumes, forms of dust, and the like, the subject encroaches upon the domain of hay fever, which is separately considered in this work.

Literature of '96-'97-'98.

Atropine rhinitis is a form of irritation of the Schneiderian mucous membrane and turbinal cavernous tissues from the effects of atropine instilled into the eye and passing through the lacrymal canal, exerting its local influence on the tissues of the nasal cavities. Rhinitis due to atropine resembles to some extent those cases of hay fever caused directly by some definite object, such as certain fruits or animals, or various medicinal agents, as ipecac, sulphur, and lycopodium. L. S. Somers (*Laryngoscope*, Oct., '97).

A predisposition to cold in the head is furnished by a variety of local condi-

tions, such as deformity of the septum, adenoids and other chronic affections of the nasal and pharyngeal passages, and perhaps by certain general dyscrasic conditions, such as syphilis and tubercle. Children are more commonly affected than adults; and women than men.

Catarrhal rhinitis is naturally prone to spread by continuity of tissue, and may or may not extend into the sinuses, naso-pharynx, middle ear, nasal duct, etc., producing added symptoms referable to the organs secondarily implicated.

Treatment.—The treatment is general and local. Much can be accomplished in the first twenty-four hours of a cold by active cathartics, prohibition of alcohol and tobacco, and a plain diet. In addition to this, sedatives—such as salol and phenacetin, 2 1/2 grains each every hour for four doses, or 15 grains of bromide of potassium repeated every two or three hours—are of marked benefit. One of the best ways of shortening the duration of cold in the head is to prohibit the constant desire to blow the nose. Although it is uncomfortable, if the patient will allow the serum to remain in the nose, it prevents by pressure further transudation and allows the glandular structure to become quiet. Saline washes should not be used during the serous stage of the disease, certainly not before the secretions become thickened.

Powders are of benefit, and I prefer the compound stearate of zinc and boric acid, to which may be added 1/2 of 1 per cent. of cocaine. This may be used at least four or five times in the twenty-four hours.

If oily sprays are used they should be exceedingly mild in combination, not adding more than a grain or two to the ounce of such remedies as thymol or eucalyptol. Stronger solutions can only

be of benefit by increasing the irritation, exciting the serous transudations and so eventually exhausting the glandular structures.

I have seen acute coryzas checked by a finely localized application of chromic acid or the galvanocautery. Undoubtedly the benefit was produced by reason of counter-irritation, and the general congestion was centered at the one point where the cautery was applied.

Inhalation of eucalyptus-oil, employed early, cuts short an acute attack of coryza. If the odor of eucalyptus-oil is disliked, 1 part of peppermint-oil should be added to 2 parts of eucalyptus-oil. Pavel I. Griaznoff (*Novosti Terapii*, No. 1, p. 5, '90).

Spray of benzoate of soda highly extolled during first stage and continued at frequent intervals during twenty-four hours. Anfruns (*Revista de Lar., Otol., y Rinol.*, vol. ix, No. 8, '94).

The effects of menthol in acute rhinitis increased by scraping a piece of it and placing the fine particles obtained between two small pledgets of cotton-wool, these held between the fingers are thus gently heated and the fumes are given off with considerable freedom. Beale (*Jour. of Med. and Dosimetric Ther.*, Apr., '94).

In acute coryza a small pledget of iodoform cotton introduced into the nares gives excellent results. Maurel (*Med. Week.*, 11, p. 573, '94).

Following procedure sometimes gives rise to excellent results in acute rhinitis: At the outset of the coryza the nasal cavities are to be sprayed with a small quantity of a mixture of 1 part of ichthyol and 100 parts each of ether and alcohol. This application of the spray is to be made only once. Unna (*Pacific Med. Jour.*, Feb., '95).

Very satisfactory results obtained in acute rhinitis from the use of chloroform. The inhalation is to be practiced several times until the first signs of anæsthesia appear. Even in cases in which the catarrhal condition was severe and extension to the bronchial tubes immi-

nent the disease was aborted. Gérard (*La Méd. Mod.*, '94).

A 1 to 2-20 solution of menthol in chloroform recommended as a means of aborting coryza in its first stage; 4 to 6 drops of the solution are poured upon a plate, the hands rubbed quickly over it, and then they are held firmly pressed together, over the nose and mouth, while deep inspirations are made through nose and mouth alternately. Secretion from the nasal mucous membrane is at first increased, but it very soon decreases again. R. Wünsche (*Aerzt. Rund.*, v., p. 662, '95).

Literature of '96-'97-'98.

If effervescent citrate of lithia, 10 grains, are taken in a tumblerful of water, when the first symptoms of acute rhinitis appear, the full development of the disease is prevented. In some cases the dose of lithia may be repeated several times. Bishop (*Laryngoscope*, Dec., '97).

Statement of Bulkley corroborated, that from 60 to 100 grains of sodium bicarbonate taken in twenty-four hours in the early stage of rhinitis, especially in subjects of the uric-acid diathesis, will completely abort the attack. Careful dieting and abundance of out-door exercise are factors that should enter into the treatment of the inflammatory diseases of the upper air-passages. J. C. Mulhall (*N. Y. Med. Jour.*, Nov. 12, '98).

Where repeated coryzas are simply an indication of a chronic pathological condition of the nose, such as deformities of the nasal septum, or adenoids, or polypi, these should be promptly removed in order to prevent acute attacks.

Simple Acute Coryza of Infants.—Obstruction of the nose in the adult is only a source of inconvenience; but in the nursing infant it becomes a serious disorder, interfering with nursing and interrupting sleep by causing dyspnea.

Suffocative attacks which may present themselves at the moment of going to sleep in infants with acute rhinitis may be confounded with croup, the

symptoms being cyanosis of the face, movements of the *alæ nasi*, nasal râles, violent action of respiratory muscles, leading sometimes to complete temporary arrest of respiration, and ending, perhaps, in convulsions. While sucking, the respiratory need may become suddenly so great that the infant throws back its head and makes an inspiratory movement, which may lead to milk's being drawn into the larynx. Tissier (*Revue Men. des Mal. de l'Enfance*, Jan., '94).

A few drops of paregoric administered several times during the day will have a quieting effect on the congested mucous membrane. Simple steam-inhalers can be procured at very little cost, and such medicaments as oil of tar, paregoric, and compound tincture of benzoin can be used. A few drops of plain liquid albolene may be placed in the nasal passages with a dropper, or a powder composed of equal parts of compound stearate of zinc and boric acid and subnitrate of bismuth can be used.

For infantile coryza and for children who suffer much from coryza, a spray of borate of soda, $\frac{1}{2}$ drachm, and infusion of coca, 8 ounces, recommended. The fluid can either be used with the atomizer or thrown into the nostrils with a dropper. This solution is capable of reducing the tendency to relapse and is safer than cocaine. W. Cheatham (Collaborator, *Annual*, '89).

In acute rhinitis of infants hydrate of terpene, $\frac{7}{8}$ to $1\frac{3}{4}$ grains, according to whether the infant is below or over 1 year of age, recommended. The remedy is to be administered three times a day. Lewy (*Archiv f. Kinderh.*, B. 17, H. 5, 6, '94).

Croupous Rhinitis.—This variety occurs under various circumstances. Aside from nasal diphtheria, which is best considered under the general heading of diphtheria, we occasionally see in what seems to be an ordinary rhinitis the formation of false membranes; and within the latter have at times been

found Klebs-Loeffler bacilli, apparently in a non-virulent condition. Other cases of pseudomembranous rhinitis follow the application of the galvanocautery to the nasal mucosa.

About 77 cases of membranous rhinitis collected. In 41 there is a clear record of a bacteriological examination, and in 33 the Klebs-Loeffler bacillus was found, while in 1 the result was doubtful. In several other cases the membranes were examined, and found not to differ from those of diphtheria. In all of the cases the disease ran a benign course, and in all but a few the membrane was limited exclusively to the nose, and the constitutional symptoms were not marked or were entirely absent.

In the great majority of cases, if not in all, the bacteriological diagnosis is the only safe one, and all cases should be considered as diphtheria until the contrary has been proved by cultural methods. In the meantime isolation and disinfection should be insisted upon. M. P. Ravenel (*Med. News*, May 25, '95).

Twenty-three cases of fibrino-rhinitis, of which eight, or a little more than one-third, revealed no diphtheria bacilli. D. B. Kyle (*N. Y. Med. Jour.*, July 6, '95).

Literature of '96-'97-'98.

One hundred and twenty cases of croupous rhinitis or membranous rhinitis reported in various papers collected. In fifty of them there appears to have been a bacteriological examination, and in sixty-five a positive result as far as Klebs-Loeffler's bacillus. J. T. Campbell (*Ann. Otol., Rhin., and Lar.*, Aug., '97).

It is a rare affection, and the rhinologist has but few opportunities to study it.

It has been thought that the gouty, rheumatic condition is a factor in producing it. Differential diagnosis will always have to be made between it and nasal diphtheria. In addition to microscopical aid perhaps these differential points are the most marked: Nasal diphtheria occurs in children, croupous rhinitis usu-

ally in adults. The exudate in nasal diphtheria is more yellow in color, is soft, friable, coming away in small pieces, whereas the cast found in croupous rhinitis may be removed entire, and is whiter and firmer. A bleeding surface will be found beneath the diphtheritic membrane, but not in the patient suffering from croupous rhinitis. In two out of five cases of croupous rhinitis which I have seen the patients had no constitutional disturbance and were about all the time. The disease does not last more than four or five days. During the first two there is a strong tendency to reformation of the membrane when it is removed. As has been said, the membrane very much resembles that which sometimes follows the use of the galvanocautery, or which appears over the point of the puncture made through the anterior pillar of the pharynx during an attack of peritonsillitis.

Treatment.—The course of this disease is limited to a few days. Internal sedatives may be administered if there is annoying, acute nasal disturbance. The length of the disease will not be shortened by the removal of the membrane or by overwashing. The removal of loosened secretions by irrigation and the insufflation of a boric-acid powder, to which may be added a few grains of powdered alum, are usually sufficient.

It is wise to isolate the patient and to burn the cloths which receive the nasal discharges.

In croupous rhinitis iron exercises peculiar influence in controlling the fibrinous exudates. Mercurial preparations also exert a decided curative effect upon the disease, especially in children, and preference should be given to the mild chloride, giving a child six years of age 1 grain every four hours, or oftener. The calomel treatment should be thoroughly

tested in the early stages of the attack in children, but if no decided amelioration of symptoms are noticed by the end of the second day, then the iron treatment should be substituted. Bulson (Columbus Med. Jour., Oct. 1, '95).

Purulent Rhinitis.—This is known to be due in individual cases to the gonococcus, streptococcus (scarlatina), and the special erysipelas-coccus and probably also to other bacilli. It is purulent from the start, and the symptoms witnessed in an ordinary catarrhal coryza assume a more violent character. This type is extremely rare in adults, and is probably far from unusual in very young children; but definite *data* are lacking upon this point.

The appearance of the nasal passages is similar to that seen in acute coryza, with these differences: whereas in the latter the secretion is a watery serum, in the former it is a thin, yellow pus which has not the adhesive quality so markedly as has the pus which has its origin in the accessory cavities.

A differential diagnosis must be made between this form of rhinitis and the many cases in which there is abundant muco-purulent secretion—sometimes almost entirely purulent because of defective posterior drainage, as in children with adenoids or in adults with polypi. A purulent secretion symptomatic of disease of the accessory sinuses is, as a rule, unilateral, and but little difficulty is experienced in tracing the secretion to the special locality affected. The nature of a unilateral purulent discharge caused by a foreign body, or a specific ulceration, or occurring during one of the eruptive diseases is readily recognized.

Treatment.—A purulent rhinitis due to the gonococcus requires careful disinfection by means of Seiler's solution, to which may be added a 10-per-cent. solution of "boroformalin," or boro-

lyptol. After all secretions have been washed away probably nothing better may be used than a powder of subnitrate of bismuth and boric acid.

Chronic Rhinitis.

General Considerations.—This seems the best name for this affection; indeed, we can no longer use as a synonym "hypertrophic rhinitis," hypertrophy being far from always existing. The same causes may produce in one case only increased secretion, in another intumescence, while in a third the entire mucous and submucous structures may become permanently thickened. Chronic rhinitis is a complex entity, made up of several clinical conditions which differ widely from one another. Leaving for convenience entirely out of consideration atrophic rhinitis, which, while it may exceptionally follow the common form of chronic rhinitis, is probably a different malady, we have first to distinguish theoretically, rather than practically, between chronic catarrhal and chronic purulent rhinitis. The last-named affection is rather a symptom of several widely different affections than a distinct disease. A discharge of pure pus from the nose is seen, for instance, in connection with foreign bodies and rhinoliths, with sinus disease, and with any form of ulceration within the nose (syphilis, glanders, etc.); it also accompanies post-nasal adenoids in children.

[Grünwald, alluding particularly to nasal suppuration, argues that pus is formed whenever the secretions of ordinary inflammation cannot find suitable drainage. As a rule, a true purulent discharge is confined to one side of the nose, because the exciting cause is generally unilateral. A purulent discharge is often fetid, and, according to Grünwald, a very large part of what is termed *ozena* is simply fetid suppuration in connection with undrained secretions (when, for any reason, there is an impediment

to either the forward or backward exit of intranasal secretions), as in ethmoidal or other sinus disease, foreign bodies, syphilitic or other ulceration, etc. It has been claimed that very young children may suffer from chronic suppurative nasal discharge which has been ascribed to the continuation of a nasal gonorrhœa contracted soon after birth or to early inherited syphilis.

Nasal suppuration, then, is an important subject clinically, but does not represent a distinct pathological process and has little in common with chronic catarrhal rhinitis. CLARENCE C. RICE.]

Chronic catarrhal rhinitis is divisible according to the stage or degree of the process into *simple* and *hypertrophic*, while the progressive tendency of the disease to lead to the production of tumor-like formations has been characterized as a terminal stage. Of the so-called intranasal neoplasms by far the greater part may be shown to originate in this manner. The papillomatous or mulberry-like growths which are frequently seen upon the posterior end of the lower turbinate body are merely an advanced stage of hypertrophy peculiar to this locality, while the polypi so commonly seen in connection with rhinitis affecting the middle turbinated have a more complex origin, but are generally admitted to be dependent upon pre-existing inflammation either of the mucosa of the affected locality or of one or more of the neighboring sinuses.

There is, however, another element to be considered in connection with chronic rhinitis—one which has greatly complicated the understanding of the disease by the general practitioner. We refer to the phenomenon of *intumescenz*, which is due to turgescence of the erectile tissue over the turbinate bodies. This swelling and consequent obstruction, for the time being, of the nasal fossæ, or rather fossa,—for it is almost

invariably unilateral, although readily alternating from side to side,—is a feature which may occur in health as a pure reflex from a variety of causes,—such as irritating vapors, the menses, sudden exposure to cold, etc., or in an acute coryza or hay fever. In chronic rhinitis, however, it plays a highly important part; so much so that to many general practitioners this intumescence is mistaken for hypertrophy. Intumescence, however, usually involves the anterior aspect of the turbinates, while real hypertrophy is apt to be posteriorly situated; intumescence is practically a universal phenomenon, while hypertrophy is by no means frequent. The gravity of error in diagnosis lies in the fact that many practitioners “burn off anterior turbinates” under the impression that they are destroying hypertrophied tissue, and thereby removing a permanent obstacle, instead of cauterizing a comparatively healthy membrane. Some authorities, such as Ingals and MacDonald, and others, probably with a view of preventing this blunder, have divided chronic rhinitis into intumescent and hypertrophic; but, of course, there is nothing to prevent the occurrence of intumescence in a nose the seat of hypertrophy. It would be correct, however, to speak of simple intumescence and intumescence with hypertrophy.

Another complicating feature in discussing the pathology of chronic rhinitis is to determine whether the condition known as *simple chronic rhinitis* should be considered an entity. If by this term is meant simple intumescent rhinitis without hypertrophy, no obscurity could result; but this is not the idea intended to be conveyed by authors who describe an affection in which not even intumescence is present, and when almost the only symptom is increased secretion.

Symptoms.—The gross appearance in the nasal passages differs according to the stage of pathological change which has been reached. In the most usual form, that of intumescence, the mucous membrane appears moist, but the color varies according to the general condition of the patient. In anæmic patients, although great boggiess of tissue is apparent, the color is not heightened above the normal, and very frequently it is less reddened. Intumescent swellings which are pale in color are also an indication of passive congestion due to nasal obstruction situated posteriorly. We notice these pale anterior swellings where polypi are present, or where posterior hypertrophies are large, and we are apt to see them in children with post-nasal adenoids. But, as a rule, in chronic rhinitis the inferior turbinated tissues are redder than normal. These anterior swellings differ in size from day to day; sometimes one nostril will be almost entirely obstructed and the other free, while at the next examination the larger swelling appears in the opposite nostril.

Where deflection of the septum co-exists, the inferior turbinated must necessarily be smaller in the narrow nostril than in the broader one, and it must not be forgotten that the size of the inferior turbinated body should always bear a proper relation to the size of the nasal passage. In a very spacious nostril the turbinated structure must necessarily be large to sufficiently exclude foreign bodies and to sufficiently saturate and warm the inspired air. Hence it should not be reduced in size even though it appears larger than normal.

With the general intumescence of the inferior turbinated bodies we may also have a degree of congestive swelling and thickening of the soft structures covering the septal partition. The touch of

the probe will demonstrate how much of this swelling is congestive and œdematous, and how much is due to real tissue-thickening. The posterior rhinoscopic view will demonstrate swelling at the posterior end of the inferior and middle turbinated bodies, but here the color is paler and we are more apt to find a true hypertrophy of tissue. We do not often note a large amount of secretion in chronic rhinitis of the intumescent variety except during acute coryza, or unless disease of one of the sinuses co-exists.

As a result of this long-continued congestion we find that hypertrophy has taken place at the anterior end of the lower turbinated and the posterior end is seen to be the seat of papillary swellings. The middle turbinated body is not so apt to be modified by hypertrophic enlargements of this character, but a chronic rhinitis here manifests itself in enlargement of bony tissue, frequently with fungoid granulations on its anterior face, or with that form of œdematous inflammatory growths which are called polypi.

The subjective symptoms depend upon the amount of nasal obstruction and its location. The obstructing tissue may cause only temporary stuffiness of the nostrils, or the occlusion may be so great as to give the patient serious inconvenience during the day, and compel him to breathe through his mouth at night. Distressing symptoms—such as pain through the forehead, eyes, and cheeks—are not apt to be marked unless the accessory sinuses are involved; but we frequently hear patients complain of a feeling of dullness, dizziness, loss of memory, partial loss of sense of smell, errors of vision, closure of Eustachian tubes, impaired hearing; and, if nasal obstruction is not relieved, he presents

the symptoms of pharyngeal and laryngeal catarrh later on.

Etiology.—It is, perhaps, safe to say that bacteria play little or no part in the etiology of chronic catarrhal rhinitis. They have not been found beneath the surface, and even upon the surface of the mucosa they occur so sparingly that the nasal mucus is reputed to possess bactericidal powers. In chronic purulent nasal discharge, on the other hand, the ordinary microbial exciters of suppuration play a definite rôle.

In a very small proportion of cases certain kinds of dust and vapors continuously inhaled in connection with the occupation or habits are a sufficient exciting cause of a form of chronic rhinitis.

Pathology.—The habit of constantly taking cold is now generally believed by rhinologists to depend upon anomalies of the septum, such as deviations, spurs, and crests; and in the case of the young to post-nasal adenoids as well. The great improvement which follows the removal of all these obstructing and irritating conditions is a sufficient proof to fix the responsibility of causation in these cases. There is a special dependence of the phenomenon of intumescence upon these deformities which shows that they contribute largely to that turgescence of the mucosa and consequent obstruction of the nose which constitutes a large part of the symptomatology of rhinitis.

[A chronic catarrhal affection in a perfectly formed nose, without septal anomalies and minus the phenomenon of habitual intumescence would represent a simple chronic rhinitis and is admittedly of rare occurrence. Since certain authors, like MacDonald, attach especial significance to the shape of the nose in connection with intumescence, claiming, as they do, that the narrow, or Hebrale, type of nose especially allows obstruction from a slight degree of turgescence, it is

evident that we must rate this narrowness of nose as a factor in the same class with septal anomalies. The high-arched palate has also been claimed as a remote factor in the production of chronic rhinitis by narrowing the vertical diameter of the nasal fossæ and thus producing distortion of the septum. But it must not be forgotten that the high-arched palate and the secondary deviation of the septum are both usually the result of long existing post-nasal adenoids, which also produce chronic rhinitis by preventing post-nasal drainage and interfering with the nasal circulation.

Naturally the implication of the size and shape of the nasal fossæ involves the question of heredity and racial tendencies in the causation of the disease. Men are affected twice as often as women: a fact which may be explained by the greater frequency of septal anomalies in men. CLARENCE C. RICE.]

The changes induced in long-standing chronic rhinitis are either diffuse or circumscribed, and it is the failure to understand the purport of this distinction which has led to much of the obscurity in which the pathology of chronic rhinitis is involved. In the natural course of events any prolonged inflammation of a mucous membrane must necessarily be attended with a certain amount of thickening and induration, with atrophy of some of the glandular elements. But there is nothing to show that this last process even attains a high degree in the nose, and to confound it with atrophic rhinitis is, for many reasons, unjustifiable.

In conclusion, then, the mucosa of the nasal fossæ as a whole undergoes the changes which occur in chronic inflammations of other mucosæ, but they are not of high degree and are completely overshadowed by certain circumscribed changes known as "hypertrophies," the presence of which gives rise to the clin-

ical variety known as "hypertrophic rhinitis."

HYPERTROPHIC RHINITIS is a phenomenon believed to depend wholly upon intumescence, which occurs only in certain areas provided with erectile tissue.

The constant determination of blood to the erectile tissues of the turbinate bodies has the tendency to cause hypertrophic thickening of the mucosa in those localities. Several points, however, remain obscure. In some individuals intumescence of years' duration does not produce hypertrophy, while in other cases the latter change sets in rapidly. Still more difficult to understand is the much greater tendency of the posterior end of the lower turbinate to undergo hypertrophy, although the remaining surface of the turbinate bodies is equally inclined to turgescence.

The general practitioner always, and we believe, justly, lays stress upon cardiac, pulmonary, hepatic, or renal affections which are competent to disturb peripheral circulation and so produce active or passive nasal congestion as factors causing nasal turgescence. The use of alcoholic stimulants and tobacco are potent factors, as is exposure incident to the irritation of many peculiar occupations. But far more important than these is the fact that in the great majority of cases nasal intumescence and hypertrophy are caused by the same pre-existing nasal conditions which have been mentioned as the cause of acute rhinitis.

Treatment.—The treatment of chronic rhinitis is to-day largely operative, but I must be careful to explain that I use this term even in describing such moderate forms of treatment as the application of chromic acid or the galvanocautery to hypertrophied tissues. The primary

indications in the treatment of chronic rhinitis are to remove obstructions so that nasal breathing, circulation, and drainage will no longer be interfered with. If crests and spurs on the septum are present and by their irritation produce intumescent swellings, what is more reasonable than that they should be removed?

No single instrument answers for the removal of all forms of enlargement or for correction of deviation of the nasal partition. It is always well to remember that as little of the mucous surface as possible should be destroyed. The saw is particularly applicable for the removal of enlargements of the cartilaginous septum, and, as a rule, there is sufficient thickness to enable the operator to remove enough of the obstructing septum without producing perforation.

It is often difficult to commence the incision with a saw, but this can be facilitated by turning the patient's head toward the nostril which is to be operated upon, thus causing the convexity of the septum to become as prominent as possible. In commencing the saw can be directed almost at right angles to the partition. After the incision has been carried down to the bony sutural line the remainder of the separation may be effected with sharp-cutting nasal scissors and the piece removed with nasal forceps. It is wise to protect a nasal ulceration made by saw and knife with a powder, like boric acid or iodol, rather than to attempt to prevent sepsis by unsatisfactory nasal washings.

If the cutting is properly done compound stearate of zinc and boric acid will almost always prevent symptoms of sepsis. If the patient shows a rise of temperature and suffers it will be necessary to commence post-nasal washings with an antiseptic solution. All danger

of sepsis is past in three or four days, and then it is better to discontinue powders and remove accumulated secretions by irrigating with a post-nasal syringe.

If the septum deviates too slightly for the use of the saw, it will be found useful to reduce the thickness somewhat by linear applications of chromic acid or trichloroacetic acid. Instead of fusing crystals on a probe it is more convenient to add a few drops of water to the crystals, thus making a saturated solution. Care should be taken not to daub this solution over the general surface, but rather to carefully localize the application.

I do not advocate the free use of the galvanocautery on the septum, but instead, a very carefully localized application may be made at a single point to cartilaginous or bony excrescences no larger than a good-sized pea. One puncture in the centre of such a swelling will reduce them sufficiently.

A word should be said in regard to the important part of restoring the nasal mucous membrane to its normal smoothness and moistness after operative work.

Connective tissue is not mucous membrane, but it can be sufficiently polished—so to say—that the surface will not cause secretions to accumulate. Friction ten or twelve times over a granular cicatrix with a disinfectant such as boroformalin or borolyptol causes the surface to become perfectly smooth and moist.

For the reduction of anterior turbinated swellings the snare is at present very infrequently used. In the older days intumescent enlargements were removed by means of the transfixion-needle and cold snare, but this has been proved to be unnecessary. Occasionally inferior-turbinated swellings progress until pediculated papillary hypertrophies

are present. The neck-like attachment of such swellings invites the use of the cold snare, but the scissors do the work much more quickly and painlessly, although the bleeding is more profuse.

In the vast majority of cases, however, the condition found at the anterior end of the inferior turbinated is of the intumescent variety, and such erectile swellings may be reduced by applications of chromic acid or by the galvano-cautery-puncture. In using the galvano-cautery too much caution cannot be used to employ it at a low grade of heat (cherry red) in order not to destroy too greatly the part to be reduced or to scorch the neighboring tissues.

Deformities about the septum should be corrected before any surgical work is directed toward the turbinated structure, because turbinated enlargements are very frequently only the result of irritation produced by abnormalities of the septum.

In regard to the posterior ends of the turbinated bones, there are very few soft-tissue hypertrophies which cannot be reduced sufficiently by means of chromic acid. It is difficult to apply the snare to the posterior ends of the turbinated bones, and no one but a skilled operator will be successful. Nothing is to be said in favor of the galvanocautery in this region, and there is apt to be troublesome bleeding if we use cutting instruments. When, therefore, inferior or middle- turbinated hypertrophies are present posteriorly, as shown by the rhinoscopic mirror, a 4-per-cent. solution of cocaine should be applied to the post-nasal pharynx and soft palate, and the self-retained palate-hook used to draw the soft palate well forward so that there is ample space to allow the chromic acid to be placed upon the posterior ends of the turbinals. With the palate forward,

the patient himself can depress his tongue with a spatula, while the operator, holding a mirror with his left hand, can with his right reach the posterior hypertrophies. (For enlargements of the middle turbinated body see ETHMOIDITIS under SINUSES, volume vi, and POLYPI in this article.)

In regard to the *medicinal* treatment of chronic rhinitis there is a tendency among patients who consult rhinologists to overwash the nostrils. I do not mean that the nasal passages should not be kept clean, but that in chronic rhinitis of the moist type it is seldom necessary to use nasal douches continually twice a day for months. Constant washing, and especially with strongly pungent solutions, produces an irritation which tends to prolong hypersecretion. Often have I seen very abundant secretion cease almost entirely as soon as the washing was stopped. Where the nasal discharge is very thin—almost entirely serous—as it is in certain irritable forms of chronic rhinitis, a slightly astringent powder—boric acid, subnitrate of bismuth, with a few grains of powdered alum to the ounce—will often stop the secretion and contract greatly-congested mucous surfaces.

Post-nasal washing by skillful hands is preferable to anterior nasal douching; and next to this the nasal douche-cup, when the patient has been impressed with the importance of keeping the mouth open and not swallowing. The cheap nasal atomizers sold are frequently of no use except to force air into the nostrils.

Post-nasal washing is necessary wherever the secretions are thick,—that is, composed of mucus and pus,—and also in all stages of atrophic rhinitis. A pint of fluid should not be used if two or three ounces are sufficient to clear the

nasal passages. Seiler's tablets, to which may be added a drachm to the ounce of boroformalin or borolyptol, are valuable as the basis of a solution for these purposes.

The proper selection of oils and powders depends upon the appearance of the mucous surfaces. Powders should not be employed, since they nearly always tend to dry on a mucous surface which shows a tendency to atrophy; the oily solutions, on the other hand, are effective. Where the mucous membrane is congested and the secretions thin and watery, nothing is more useful than a powder such as 1 drachm each of boric acid and subnitrate of bismuth, 10 grains of phenacetin, and 5 grains of eucaine. Briefly, the indications in the treatment of chronic rhinitis are, first, to reduce or remove hypertrophies and swellings, and after that to encourage the return of the nasal passages to their normal condition by proper cleansing, and by protecting the mucous surfaces with a carefully-selected oily solution or with powders. I believe that the benefit to be derived from oily solutions is, first, by reason of the protection they give to mucous surfaces, and, second, by the astringent effect secured through the rapid evaporation of such volatile substances as menthol, thymol, and eucalyptol, and the essential oils.

Atrophic Rhinitis (Dry Catarrh; Fœtid Catarrh; Ozæna).

This form of rhinitis, though less common than the moist and intumescent type just considered, is very frequently seen. Two types of cases should be distinguished: First, the *true atrophic rhinitis*, manifesting itself by the dry and granular appearance of the mucous surface and by the accumulation of dried secretions and scabs, which are seen filling the nasal passages. There is atrophy

of all turbinated structures, the middle turbinated alone being sometimes excepted. Second, *pseudo-atrophic rhinitis*, a form simulating the former, in which there is a simple dryness of mucous surface and a shrinkage of the erectile structures of the nose and occurring only as an indication of a constitutional condition from any exhausting disease. The dryness and the apparent atrophy here are symptomatic of constitutional debility rather than a clearly-marked nasal affection.

Symptoms.—Atrophic rhinitis is characterized by three leading symptoms, viz.: atrophy of mucosa and bone, formation of a rapidly-drying secretion, and fœtor. With regard to the fœtor, it does not seem due to the ordinary putrefaction of albuminous substances, but bears a specific character.

Loss of smell is not an infrequent symptom, and in my experience middle-ear catarrhs are more frequently associated with this form of rhinitis than with the moist type. Interference with nasal respiration is caused by the dryness and scabbing, and by the enlargement of the middle turbinated body, which frequently co-exists.

Study of eighty consecutive cases of ozæna shows that disease of the middle or internal ear is a frequent complication, occurring in 55 per cent. The middle ear was affected in thirty-eight of the eighty cases and the internal ear in eight, the disease of the former being attributable to closure or irritation of the Eustachian orifice, that of the latter to some constitutional cause, such as syphilis, tuberculosis, or infectious diseases which affect alike the nose and the internal ear. Ozæna was found chiefly in young persons, in women more than men; it was usually bilateral, fœtid in 90 per cent. of the cases, often affecting the naso-pharynx, rarely the larynx and trachea. In a few cases the middle turbinated bodies were hypertrophied or

covered with mucous polypi, and in these there was suppuration from the accessory cavities. J. Morf (Arch. of Otol., No. 4, '94).

The diagnosis of atrophic rhinitis is not difficult even in its earliest stages, where nothing more is present than the commencement of dryness of the mucous surfaces. But it must be remembered that a condition of dryness of the mucous surfaces occurs in debilitated persons, which rapidly tends to self-recovery so soon as the general health is restored. But the common picture of a grayish mucous surface in the nostrils too patulous because of atrophied inferior turbinated bodies, combined with dried secretions attached to all prominent points in the cavities, will readily distinguish this disease from other forms of chronic rhinitis. We have the moist and the dry varieties of rhinitis apparently combined in the same patient when a widely-deflected septum shows a moist condition of the mucous membrane in the narrow nostril, and a dry atrophied condition in the more spacious nasal passage. Atrophy seems to have taken place in such cases as a result of the overphysiological work performed by the larger of the two anterior cavities.

Etiology and Pathology.—In the etiology of atrophic rhinitis cause and effect seem to have been hopelessly confounded. It is an admitted fact that the shape of the nose is peculiar to the disease—that the nasal fossæ are ample and the turbinated bodies small; but while some authorities regard these changes as a part of an atrophic involution, others regard them as antedating the disease and contributing to its production. The fact that the nasal cavities in atrophic rhinitis are lined with squamous epithelium in place of the columnar ciliated variety has also appeared to

me to influence the development of the disease. However, cumulative evidence seems to be on the side of the theory of a primary underlying deformity. The recently published essay by Meissner, in which many elaborate measurements were given, appears to prove that the flat, depressed nose of ozæna is a contributory cause, and not a result of the disease; and that the epithelial metaplasia by which pavement-epithelium appears in place of the natural columnar variety is a primary condition, and not the result of local disease. A somewhat analogous condition may be seen in the coarse skin and epithelial changes which play so prominent a part in causing many cases of acne juvenilis.

It seems beyond dispute that atrophic rhinitis is a disease of the formative period of life, and that in most cases it has its beginning at a very early period, even the first few years of life. As in all similar affections, the leading question must be to determine whether atrophic rhinitis is actually congenital or acquired through the action of causes operating in infancy.

Heredity insisted on as a causative influence in atrophic rhinitis. Case of a family in which the mother and nine of her descendants had ozæna. Rosenfeld (Revue de Laryn., etc., Oct. 15, '90).

Literature of '96-'97-'98.

In 142 cases in private practice 80 were males and 62 females; the youngest was 6 years of age, the oldest 81; 58 were between 25 and 40 years of age, 37 were between 15 and 25, only three were under 10, 15 were between 40 and 50, and 8 were between 60 and 65. Of these cases, 55 complained of fætor, more or less marked. In 47 the sense of smell was impaired, in 20 there was anosmia. In 28 of the cases the hearing was affected. Preceding history of the catarrhal condition before presenting themselves for treatment showed that

they had suffered from seven to twenty-five years in 72 of the cases, and less than two years in 25. Only 8 of the cases showed signs of tuberculosis, 1 of them being laryngo-pulmonary tuberculosis; in 2 there was distinct scrofulous history; in 5 there was a history of syphilitic infection. J. E. Rhodes (*Jour. Amer. Med. Assoc.*, June 26, '97).

An increasing number of experienced clinical observers ascribe atrophic rhinitis to the action of certain severe diseases during the first year or two of life, viz.: nasal gonorrhœa and inherited syphilis of an attenuated type. If this school of clinicians is correct in its views, the peculiar changes in the shape of the nose and in its epithelial lining would have to be attributed to the effects of one or the other of these diseases upon the undeveloped tissues of the child.

Gonorrhœa and syphilis have little in common and the coupling together of these affections in the etiology of a given disease may appear to be a forced attempt to connect disease with vice. As a matter of fact, however, both these affections provide a ready soil for the action of ordinary pyogenic germs. In long-standing urethral gleet it is not the gonococcus, but the staphylococcus, which we encounter. The syphilitic diathesis, whether it be congenital or acquired, offers special predisposition to suppuration. The two diseases then could contribute to atrophic rhinitis by producing a true purulent catarrh of the nose, which ought to produce far greater ravages than does ordinary catarrhal rhinitis, and produce them much more rapidly. It is quite conceivable that a purulent rhinitis in an infant could interfere with the onward development of the turbinate bodies and at the same time practically destroy the mucosa.

With regard to the bacterial origin of

ozæna aside from the possible rôle of the staphylococcus in infancy, it appears safe to say that, despite the several varieties of organisms identified with the disease by various investigators, all hitherto described play no further rôle in the disease than as elements of putrefaction or desiccation.

The bacillus of Abel is claimed by its discoverer and by others to be the actual cause of this disease. If a bacillus has been found which can generate the rapidly drying, fœtid secretions, the atrophy may be explained by the pressure effects of these tenacious scabs upon the mucosa. It is claimed that the ozæna which is caused by Abel's bacillus may readily extend to the sinuses and there cause suppuration.

Literature of '96-'97-'98.

Ozæna believed to be caused by an attenuated bacillus identical with that of Loeffler, but with virulence much lessened; this was found not only on the surface of the mucous membrane and in the exudate, but beneath it. It probably causes a chemical change in the secretion and a resulting atrophy. Bel-fanti and Della Vedova (*La Sett. Med.*, Apr. 4, '96).

In a series of 100 cases, examined with special reference to the Klebs-Loeffler bacillus, 20 were found having chronic atrophic rhinitis. These bacilli and others were found in 26 different cases, of which 11 were atrophic. The presence of the bacilli was attributed to infection, a pathological condition in the nasal chambers providing a suitable soil. Vansant (*Jour. Amer. Med. Assoc.*, Feb. 27, '97).

The important question of the etiology of atrophic rhinitis is therefore narrowed down to a single alternative: It is due purely to a congenital or inherited condition, or it is dependent upon a pathological process following disease in infancy, viz.: a purulent ca-

tarrh which is a sequel of nasal gonorrhœa or a complication of congenital syphilis. If such a group is recognized there could be no possible reason for not including cases of scarlatina in which purulent rhinitis co-existed; nor, in fact, any other condition capable of contributing to the maintenance of this form of rhinitis.

The weak point of the staphylococcic theory is the almost complete absence of cases or statistics to support it. The next decade should witness the solution of this problem.

[Zuckerkindl, in the course of many autopsies on newborn children, failed to find any congenital anomaly like insufficient development of the turbinated bodies. The hypothesis, therefore, that these bodies are unable to present sufficient mucous surface to take up enough moisture to prevent the desiccation of the nasal mucus must be explained on some other ground than congenital defect. But we are naturally forced to admit that if this atrophic condition is not congenital it must be acquired in early childhood as a sequel of a purulent catarrh. CLARENCE C. RICE.]

While a certain degree of atrophy may follow a long-standing chronic rhinitis, true atrophic rhinitis is a disease *sui generis*, the nature of which still remains partly in obscurity. Like chronic rhinitis proper, it appears to be essentially predisposed to by some abnormalities of the nasal passages, not alone of its osseous frame-work, but of its epithelial lining, as well.

Treatment.—While atrophied tissues cannot be replaced by any medical or surgical treatment, it is encouraging to note that proper remedies can relieve the patients of the distressing local dryness and of the fœtid odor they exhale.

Although many drugs have been employed in the treatment of atrophic rhinitis, yet they have nearly all been

used upon the general principle of producing what is called by some "stimulation," by others "irritation." These two terms, I imagine, are alike in kind, differing only in degree. The German school, clinging to the belief that this disease is due to the presence of bacilli, advocate the use of solutions of bichloride. Koch tells of the great benefit and complete cure in some cases of atrophic rhinitis by the use of a spray of 1 to 4000 mercuric bichloride. Löwenberg always uses antiseptic douches of mercuric bichloride (1 to 4000), having first removed the crusts with warm saline solution. Thost applies bichloride of mercury in a solution of 1 to 2000 with a camel's hair brush twice a day. Many clinicians have adopted this measure.

Literature of '96-'97-'98.

Ozæna is caused by an attenuated type of diphtheria bacillus, and not by the bacillus mucosus ozænae. To render this view practicable antidiphtheritic-serum treatment was instituted, and in half the cases it produced the disappearance of the fœtor, turgescence of the mucous membrane, and a fluid consistency of the nasal secretion. However, many injections, in one case repeated thirty times, are necessary. Belfanti and Della Vedova (Gaz. Med. di Torino, Apr. 2, '96).

Sixteen cases of ozæna treated with antidiphtheritic serum. Although all the cases were improved, not one was cured. This is ascribed to the insufficiency of the dosage employed. Specific elective action of the serum on the diseased nasal mucous membrane confirmed. Gradenigo (Archiv. Ital. di Otol., vol. iv, fasc. 2, '96).

Ten cases of ozæna treated with subcutaneous injections of antidiphtheritic serum. Treatment was first commenced by injecting subcutaneously 20 cubic centimetres of the antidiphtheritic serum prepared in the bacteriological laboratory of the Copenhagen University. This serum has a strength of about 100 anti-

toxin units in each cubic centimetre. The dose was repeated a few days later. This dose was soon found to be too strong. By degrees it was found that 10 cubic centimetres was a proper dose for adults and 5 cubic centimetres for small children, the dose being increased now and then to 15 cubic centimetres in adults. It was found best to wait to repeat the dose until eight to twelve days have elapsed after the previous injection. Opinion is expressed that the injection of antidiphtheritic serum is the most effective remedy for ozæna yet known. Holger Mygind (*Jour. of Laryn., etc., Aug., '98*).

The use of the galvanic current recommended by Shurly has been praised. The positive pole is applied to the back of the neck and the negative pole in the nasal cavities. The faradic current has also been used, as have the copper electrodes, on the principle of electrolysis.

Literature of '96-'97-'98.

Of 10 cases of ozæna treated by electrolysis, in the majority of them there was undoubted improvement, both subjectively and objectively, while the treatment lasted, but after its cessation the cases again relapsed. Hendelsohn (*Monats. f. Ohrenh., Aug., '97*).

Among the drugs which have been employed in this way are iodoform, iodol, aristol, salicylic acid, camphor, iodine, perchloride of iron, tannin, alum, rhatany, and opium. Medicated bougies manufactured with a basis of gelatin and glycerin and medicated with the drugs just mentioned have been used a good deal in atrophic rhinitis, and this method by which drugs can be kept in contact with the mucous membrane for a long time seems to be a reasonable one.

The inhalation of stimulating volatile substances obtained from the essential oils and from cubebs, tar, eucalyptus, and thymol has also been largely employed; and we find in the shops a num-

ber of varieties of so-called autoinsufflators, by means of which the patient is enabled to blow into his own nostrils the fumes of carbolic acid, menthol, oil of pine, etc.

Thymol used for four years with success in atrophic rhinitis. Watery solution of the strength of $\frac{1}{2}$ grain to $1\frac{1}{2}$ grains to the ounce is applied in the form of a fine spray every other day, after careful cleansing with a weak alkaline solution. Cleansing should also be regularly practiced at home by the patient, who may then apply a solution of thymol in albolene by means of a few puffs from an albolene vaporizer. Wright (*Med. Rec., Aug. 15, '91*).

Literature of '96-'97-'98.

Among drugs which have given good results as stimulants in the treatment of atrophic rhinitis, thymol continues in the first rank; it may be used in watery solution with alcohol and glycerin, but is much better employed dissolved in one of the petroleum oils; albolene, glymol, or benzoïnol may be used, the thymol being in the proportion of from 3 to 10 grains per ounce.

Frontal headache, lachrymation, or a severe stinging sensation in the nose should always be regarded as indications for the use of a weaker solution. R. W. Seiss (*Med. News, Nov. 28, '96*).

A somewhat different plan of treatment, but intended to produce proper stimulation and secretion, is called "massage" of the mucous membrane. Laher, of Vienna, found this method of treatment most satisfactory. Cotton is wrapped around a probang introduced against the atrophic mucous surface and held in position by the left hand, while regular motion is made by vibrating the left arm with the right hand. After a few days normal secretion is established and the crusts become thinner and fewer in number.

Massage of the atrophied mucous membrane with a thin sound wrapped

around with a little cotton, and carrying a 20-per-cent. pyoktanin-lanolin ointment, advised. By a gentle to-and-fro movement the entire diseased surface is stroked with the medicated cotton. Demme (Med. Press and Circular, Aug. 19, '91).

The use of destructive agents in the treatment of this disease deserves only to be censured.

The use of hydrogen peroxide seemed for a time to promise great amelioration in this disease, and as a germicide and disinfectant its ability is unquestioned. It is, however, rather troublesome to employ, and, while it produces cleanliness, is not a useful stimulant, but leaves the mucous membrane quite as dry as before. A strong solution is quite irritating and apt to produce a subacute nasopharyngeal catarrh.

Bromoform recommended as a topical application in atrophic rhinitis after thorough cleansing with hydrogen dioxide. S. Solis-Cohen (Med. News, July 11, '91).

One of the most valuable agents was obtained when the various oil preparations came into use. As protectives they are certainly sedative in their effect, and so allay irritation; as lubricants, they prevent the formation and retention of scabby crusts; as vehicles for stimulating drugs, they hold them in position for a much longer time than when watery solutions are employed. Many drugs have been used, in oily solution, in the treatment of atrophic rhinitis where disinfection as well as stimulation was desired, such as iodol, aristol, iodoform, etc.

In regard to nasal irrigation it is wise to employ the smallest quantity of fluid which will adequately clean the nasal passages, and, except in extreme cases of nasal ozena, the post-nasal syringe is an adequate instrument. Sometimes pa-

tients succeed better in removing the dried scabs when they first spray oil into the nostrils.

There are not many cases in which the nasal douche-cup does not furnish sufficient fluid, if the saline solution—and we like Seiler's as well as any—is allowed to remain in the nostrils a few moments in order to separate the dry secretions from their attachments. This is a wiser procedure than using greater force with the fountain-syringe, or blowing the nostrils with great intensity. When the nostrils are cleaned, if the middle turbinated body offers much obstruction or is wedged against the septum, it is desirable to make a channel between the two, and this can be done by removing the soft structures and perhaps a small part of the bony tissue with scissors. The snare is hardly a safe instrument, as it will sometimes remove the entire middle turbinated body; and with the crushing forceps more tissue is frequently taken away than is expedient.

It is most important to correct the granular surface of the mucous membrane, which frequently presents small ulcerative points where the scabs have been attached. Friction with a stimulating disinfectant is much better than applications of nitrate of silver or of any other drug.

The use of weak solutions of bichloride, or of 50 per cent. of borolyptol or of boroformalin, applied by rubbing the mucous surface with a hard cotton pledget for perhaps half a minute at a time, produces, after a few applications, not only an even surface, but a slippery one, whereas solutions of nitrate of silver nearly always leave the mucous membrane granular enough to retain the secretions.

After the washing at home and the stimulating friction at the office, the

next most important procedure is suitable and constant lubrication with oils. No special advantage is obtained by incorporating the many drugs which have been mentioned in the oily solutions. Protection and lubrication are to be insured. The matter of stimulation is a very uncertain factor, and, if great stimulation is produced by pungent drugs, greater dryness results.

In those cases only where there is a tendency to subacute inflammatory attacks with discharge of watery secretion should powders be employed. We see this condition in children in which a purulent rhinitis is rapidly assuming an atrophic state. A combination of 75 per cent. of compound stearate of zinc with boric acid and 25 per cent. of compound stearate of zinc with alum is especially useful. This powder should not be used after the discharge has been stopped and congestion controlled, as it tends to produce dryness. In the markedly congestive forms of atrophic rhinitis seen in immoderate cigarette-smokers and drinkers, this powder is also valuable.

Literature of '96-'97-'98-'99.

In treatment of *ozæna* removal of the pus and crusts every morning and insufflation with a powder-blower three times a day of a mixture of equal parts of citric acid and sugar of milk recommended. Hamm (*Münch. med. Woch.*, No. 15, '99).

Too much attention cannot be paid to the improvement of the general health, particularly by fresh air and healthful exercise. Ziem ordered his patients to the sea-shore or to the woods for a certain time each day, in order that they might, as he expressed it, "thoroughly ventilate their nostrils." Probably the sea-shore is better for these cases than the mountains.

Tumors of the Nasal Cavities.

Mucous Polypi.—Polypi, while usually classed under the head of new growths, are now generally believed to be of inflammatory origin. They are generally multiple and often bilateral. The great majority of them originate from the mucosa covering the middle turbinated bone. MacDonald describes polypi as ordinary inflammatory products peculiarly modified by the physical conditions in which they exist. The most striking feature of the polypus is its tendency to absorb and retain moisture, which gives to it its oedematous, transparent, jelly-like character.

Symptoms.—The symptoms are primarily those of obstructed nasal passages. Rhinitis is present, the patient constantly taking fresh colds. During the day the patient sniffs or attempts to force air through the nose from behind, while at night he usually snores loudly. Local reflexes are often present, such as cough or lacrymation, while cerebral symptoms often occur, including dizziness and aprosexia. The sense of smell is obtunded or lost. All of these symptoms are much aggravated during cold weather. In long-standing cases asthmatic symptoms frequently occur. But whether they are occasioned by a congestive bronchitis or are simply reflex phenomena referable to nasal disturbances it is not always easy to determine. Numerous cases of hay fever have been reported in which polypi were present and yet there was no bronchial disturbance. But, as a rule, if the polypi are of long standing, pharyngeal and bronchial catarrhs are apt to be present.

The amount of nasal discharge may be copious, and it may be thinner than the discharge of ordinary rhinitis; in fact, the thin, profuse, watery discharge known clinically as *naso-hydrorrhœa* is

occasionally a symptom of polypus. Speech is peculiarly modified.

All the symptoms of polypi are aggravated during wet weather on account of the capacity for absorbing moisture possessed by this variety of growth.

Polypi may, under certain circumstances, cause obstructive symptoms of the ostium maxillare, nasal duct, and Eustachian tube. According to Grünwald, pus is present in about 86 per cent. of all polypi, while the presence of a polypus usually implies sinus disease.

Diagnosis.—The existence of a mucous polyp or polypi can be suspected by the symptoms of long-continued nasal obstruction, the nasal discharge, the peculiar hollowness of the voice, and the motion of these growths, which is easily appreciated by the patient. An examination of the nostrils, however, quickly shows a white, transparent, glistening enlargement, which resembles no other growth, unless it is adenosarcoma. It is probably true that mucous polypi sometimes degenerate into a form of nasal sarcoma. In some instances the appearance of the two growths resemble one another, and this is most apt to be true when mucous polypi have regrown several times, because congestion increases with each regrowth of the mucous polypi and they contain more connective tissue and blood-vessels at each regrowth.

Sarcoma of the nasal passages presents a granular surface, bleeds easily, crumbles away in pieces when attempts are made to remove it, and frequently involves the antrum and occasionally the orbit.

Etiology and Pathology.—While the inflammatory origin of polypus is generally conceded, it is impossible to state why they do not occur with equal readi-

ness in all cases of chronic rhinitis affecting the middle turbinated. With regard to the relation of polypus to ethmoiditis, this association has often been recorded. There does not seem to be any radical distinction between the œdematous granulations which accompany ethmoidal disease and polypi which are unaccompanied by the latter malady. Polypi often contain fragments of bone which would seem to show that the formations originate from the fungoid granulations associated with ethmoidal disease.

It was formerly supposed that development of mucous polypi was primary, and suppuration of the ethmoidal, as well of the maxillary sinus, secondary to these growths, the explanation being that the presence of polypi either produced an aggravated rhinitis or else mechanically closed the nasal openings into the maxillary sinus and the ethmoidal cells and thus produced a suppurating inflammation. It is generally felt, however, that the reverse is true, and that mucous polypi are of inflammatory origin and the result of a chronic middle turbinal rhinitis and ethmoidal disease. The character of this ethmoidal disease is, as a rule, simple in its commencement; but, as the result of enlargement of the middle turbinated and of the development of this œdematous granulation-tissue, or of polypi, suppuration usually occurs later.

Pedunculated polypi and the condition of thickening on the anterior face of the middle turbinated formerly termed "sessile polypi" are histologically identical, differing only in their œdematous quality. Polypi occur much more frequently in men than in women and are rarely seen in patients under the twentieth year.

Treatment.—The old method of operating by traction with forceps is no

longer in vogue. The removal can be much more easily and thoroughly effected by means of the cold wire-snare. A 5-per-cent. solution of cocaine is sufficient to relieve pain and to reduce congestion and swelling so that the polypi may be easily seen, grasped, and removed. Very little bleeding follows their removal, but it is better to tighten the cold snare slowly in order that the polypi may be removed at their attachment. Three or four operations are sufficient to clear both nasal passages. The thickened tissue covering the middle turbinated bone can be excised with nasal scissors and removed with the cutting-forceps.

After the polypi have been taken away the nasal passages should be irrigated at least twice a day with proper disinfectants used with a post-nasal syringe. The patient should visit his physician at least once a month in order to ascertain if there is any attempt at regrowth, and that it may be prevented by the application of the galvanocautery to the cicatrix. After careful cauterization there is often no disposition toward regrowth. In removing polypi as little as possible of the normal structures of the nose should be sacrificed in order to prevent the development of chronic purulent rhinitis.

In considering the prognosis in cases of mucous polypi, it should be remembered that these growths are inflammatory swellings resulting from a middle turbinated and ethmoidal inflammation. After they have been entirely removed, therefore, there remains enlargement of the middle turbinated bone itself, and extensive tissue thickening on the anterior, posterior, and the internal face of the middle turbinated. The portion wedged in between the middle turbinated and the septum may require re-

duction or complete removal. A portion of the middle turbinated bone itself will perhaps require to be taken away, in order to obtain nasal respiration and drainage and to reach the seat of suppuration in the anterior ethmoidal cells and to relieve the painful symptoms which accompany a suppurating ethmoiditis. While it is safe to promise the quick removal of mucous polypi, it should be remembered that the patient is frequently left with a chronic rhinitis not easily corrected.

Miscellaneous Tumors.—**FIBROMATA** originating in the anterior nasal cavities proper are exceedingly rare. Indeed, it is probable that the majority of cases reported as such were mistaken for other growths. Removal with the wire snare is the only measure indicated.

PAPILLOMATA.—These wart-like growths are somewhat less rare than the former neoplasms. They are usually situated in the anterior portion of the septum or wall, or on the floor of the nasal cavity. They may grow sufficiently to cause obstruction and bleed easily. They are readily removed with the snare.

CYSTS.—These growths are occasionally met with in the nasal cavities at the anterior end of the middle turbinated bone. They usually contain yellow, viscid liquid. They cause obstruction and sometimes quite severe pain, and are often associated with mucous polypi, from which they differ by their hardness. They may either be perforated by means of the burr or trephine, or cut off with rongeur forceps or a strong wire snare.

SARCOMATA can no longer be considered as rare, judging from the number of cases reported. Repeated epistaxis, increasing obstruction and pain at the brow, sometimes radiating to the temple, are the most prominent symp-

toms. The growth being usually located in the upper part of the nasal cavity involved, orbital pressure may occur,—exophthalmos, widening of the bridge of the nose, etc., being occasionally produced.

When the growth can be reached, removal with the snare and subsequent curetting are sometimes possible. But often the location of the tumor is such as to expose the patient to meningitis, even if simpler measures such as cauterization by chemicals or the cautery are tried.

CARCINOMA seldom develops in the nasal cavities. It resembles sarcoma in its development, though hæmorrhage is apt to occur later. Removal, when the diagnosis has been proved by microscopical examination, is useless.

Septum, Diseases of the.

Abscess.—Abscess of the septum is by no means rare. It is usually due to a blow on the nose, but may, though seldom, be idiopathic or associated with perichondritis or erysipelas. The traumatic abscess is usually a suppurating hæmatoma, the formation of pus having been antedated by the extravasation of blood from the effects of the blow.

Occasionally abscess of the septum is a complication of nasal diphtheria and scarlet fever. It has been noted in children as a result of foreign bodies, and it may be caused by sepsis through any abrasion, occasioned, for example, by uncleanly methods of treatment. It occasionally follows the use of the galvanocautery on the nasal partition, but it very seldom complicates a wound produced by the saw or any cutting instrument.

The most frequent seat of septal abscess is the anterior, inferior part of the septum, and when of traumatic origin

is generally bilateral. The majority of cases occur in children.

Symptoms.—The abscess does not appear, as a rule, until a considerable time after the blow or fall. After the period of incubation the pus forms rapidly and the tumefaction quickly obstructs the nose.

In the acute cases the nose is painful and swelled and the congestion may even extend to the cutaneous surface. Examination with the nasal speculum shows the nasal openings closed, usually on both sides, by red swellings, which can be easily retracted by the pressure of the probe. Sometimes it requires the use of cocaine to determine that the swellings are a part of the septum and not attached to the turbinated wall. It is important to remember that cocaine does not reduce abscess-swellings of the septum as it does turbinal congestions.

Perforation of the septum rarely results from an abscess unless long neglected or treated unscientifically. But there is danger of weakening the anterior support sufficiently to occasion some depression at the tip of the nose.

Treatment.—The abscess should be punctured with a narrow-bladed knife after cocaine has been applied. The nostrils should be irrigated with a 1 to 4000 mercuric bichloride or a 25-per-cent. solution of boroformalin. Recovery, as a rule, is very rapid.

Fourteen cases of acute abscess of nasal septum personally observed. In 5 cases the etiology was obscure; in the others it was either typhus, trauma, or erysipelas. Subjective signs—marked stoppage of the nose, and nasal speech; objective signs—a circumscribed, round, fluctuating red swelling, filling almost the whole lumen of the nose, and possible in some cases to confuse with a polypus. Treatment was free incision, followed by iodoform-gauze tampons. No perforations of the septum observed, as

a result. But nasal deformity followed, due to luxation of the nasal bones. W. Wroblewski (Inter. Centralb. Laryn., etc., Apr., '95).

HEMATOMA.—In most cases of traumatic abscess an extravasation of blood occurs directly after the injury, and forms a *nidus* for the development of the future abscess; but we may have abscesses without previous hæmatoma, while hæmatoma does not always suppurate.

Deviations of the Septum.—Anomalies of the septum, while almost universal in frequency, are able to cause such serious inconvenience and harm in many cases that it is best to regard them as pathological, especially as their rectification is followed by decided improvement.

The departures from the normal are of two kinds, viz.: local thickenings, which are spoken of as *spurs* or *crests* according to their extent, and *deviations*, in which the septum is simply bent in one of many possible ways.

Symptoms.—Many of the minor degrees are quite free from active symptoms, and even in severe forms the external deformity may be the chief sign of abnormality. When symptoms are present they assume the form of nasal obstruction and catarrh; as already stated under the head of chronic rhinitis, that condition appears, in the majority of cases, to depend almost entirely for its chronicity upon septal anomalies.

The symptoms of obstruction do not differ from those due to nasal stenosis from other causes.

In some sigmoid deformities both nostrils may be obstructed. The contact between a deviated septum and the turbinated side of the nose produces a chronic congestion probably quite as much from irregular atmospheric press-

ure-effects as from simple irritation, which give rise to repeated attacks of rhinitis. As a result of a general nasal catarrh, pharyngeal and laryngeal inflammations develop. The local disorder progressing slowly, the patient does not consult the rhinologist until he suffers great inconvenience from nasal obstruction.

In addition to the ordinary deformity, —one side of the nose being more prominent than the other, and the tip of the nose turned from the middle line of the upper lip,—the anterior cartilage is so enlarged and bent as to show prominently in one or other of the nostrils.

The character of the deviation can be determined by using the nasal speculum: a convexity will be found in one nostril, its long axis running vertically, horizontally, or obliquely, and a corresponding concavity in the other. There is usually a large amount of extra thickening at the point of greatest convexity. In the concave nostril prominent spurs and crests are frequently seen running horizontally along the sutural ridge which binds the septum to the superior maxilla.

Etiology.—In spite of the fact that the rhinologist constantly sees abnormal conditions of the nasal septum, and has an unlimited opportunity for studying them, it remains true that in the majority of instances it is difficult to determine the exact causes of septal deviations. Sir Morell Mackenzie examined 2150 skulls, and of these a little more than 76 per cent. presented some degree of deviation: 38 per cent. to the left, 28 to the right, and the remainder irregular.

It is usually a matter of more or less conjecture whether in a given case the deviation has been occasioned by congenital causes or errors of development

in very young life, or the pressure-effects of hypertrophy of some other bony portion of the nose,—as, for instance, pressure of the middle turbinated upon the septum,—or whether it is caused by the large variety of traumatic influences. Undoubtedly, in many instances several of the factors named have exerted an influence. In a large majority of the cases of thickening of the partition resulting in spurs and crests, the etiology cannot well be defined unless we are willing to be satisfied with the results of simple catarrhal inflammation. Many observers are content to believe that traumatic causes are the most frequent. Hardly a case appears in which there is not some history of a blow or fall. But actual fracture or dislocation of the septum is not a common occurrence, and blows are rarely so severe at the time as to produce deformity. Still, the fact that men are much more commonly affected than women, would tend to sustain the traumatism hypothesis.

Post-nasal adenoids and the subsequent frequent attacks of acute catarrhal rhinitis are probably the most potent factors in causing deviation of the septum, the sequence of injurious results being as follows: The post-nasal space filled with lymphoids; nasal stenosis; chronic mouth-breathing; the cheek-muscles extended and pressing hard upon the superior maxilla diminish the lateral diameter of this bone, force upward the arch of the hard palate, and so shorten the vertical measurement between the base of the skull and the roof of the mouth in which the nasal partition must develop. The shortened diameter necessitates curvature of the nasal partition upon itself in one of the many forms. Perhaps traumatism is frequently added as a cause to the above conditions.

When a nasal septum is widely deviated from the median line and there is no history or evidence of post-nasal adenoids, and the roof of the mouth is not high, we may believe that traumatism has probably been the cause of the mischief. Enlargements of the middle turbinated bone are sometimes sufficient to push over the bony part of the nasal partition. Hypernutrition of any portion of the septum, especially along the sutural lines, produces congestion and local thickness: spurs and crests. Irregular development from different centres of growth would be sufficient to distort the nasal septum from a straight line.

Again, a single nasal passage may be blocked, which tends to a greater development of the free nostril and a deviation of the partition toward the occluded side.

Of 1050 patients indiscriminately examined personally, only 100 had normal noses; that is to say, fairly vertical septa and symmetrical nasal cavities. The ages of the patients varied from one year to eighty. It was rare to find any obstruction, unless due to temporary causes, below ten years of age. The above statistics showed that nasal obstruction was seldom or never congenital, was rare below ten years of age, and was more common after puberty. If from any cause—*e.g.*, paralysis or paresis of the nasal dilators, injuries, inflammations of cartilage, enlarged inferior turbinals, polypi, catarrh, etc.—one nostril becomes blocked up, the stream of air passing out of the one nasal cavity into the lungs exhausts the air in the closed nasal cavity, with the result that the walls of the nasal chambers become acted upon by a pressure exactly in proportion to the degree of rarefaction. Hence we have varying degrees of septal deviation and pinched and approximated upper maxillary bones, while upon the palate the effect is to produce high-arching, with consequent irregular erup-

tion of teeth. Mayo Collier (Med. Press and Circ., Nov. 20, '95).

Treatment.—Fortunately, in a large majority of instances the patient consults the rhinologist, not to have the external deformity corrected, because it is not sufficient to be a matter of much importance, but rather to have the obstruction to nasal respiration removed. It is again fortunate that usually the partition is so thickened that enough of the convex side can be removed to secure ample breathing space without perforating the septum, and without the necessity of the more severe operation of fracturing the nasal partition. Nearly every rhinologist has devised some instrument for the removal of a portion of the nasal septum, or for its forcible replacement in the median line. The saw is probably used more than any other instrument, and it is especially applicable to cartilaginous deviations, which are the most common variety. Nasal saws have not, up to the present time, been made sufficiently strong so that bony deviations or enlargements can be easily excised with them. Enlarged antero-posterior sutural ridges which fill the inferior meatus are best removed with stout scissors or with a trephine. Small spurs can be reduced by a galvanocautery-puncture, and sometimes with chromic acid. Electrolysis is also recommended by various clinicians.

In treatment of septal spurs and deviations by electrolysis, preference should be given to steel needles as being more resistant and cheaper than platinum. They also penetrate more easily into the portions of cartilage which it is desired to destroy. The needles are combined with an electric battery of at least thirty couples, connected with an ampèremeter, and an immersion-rheostat. The negative pole is placed, according to the case, over the centre of the spur, and the positive pole outside or above this latter.

An important point is not to put any needle too near the base of the deviation, in order not to expose the septum to perforation. According to the volume and hardness of the growth to be destroyed, the intensity of the current should vary from 18 to 25 milliamperes, and last from twelve to fifteen minutes. When the needles are well placed, these intensities suffice for the destruction in a single sitting of a spur or septal outgrowth in most cases.

During electrolysis the opposite fossa ought to be watched through a speculum—*i.e.*, the undeviated septum—in order to make certain that no gas escapes from this side, which would indicate that the electrolysis is carried beyond the point desired. Moure (Jour. of Laryn., vol. viii, 236, '94).

Conclusions in regard to electrolysis by a current-controller for the reduction of spurs of the nasal septum are: 1. That strictly cartilaginous spurs can be wholly removed by electrolysis in from one to three operative sittings. 2. That spurs composed of both cartilage and bone can be reduced in size, but not wholly removed, by electrolysis, the amount of reduction being commensurate with the proportion of cartilage in the composition of the spur. 3. That bony spurs can *not* be effectively removed by electrolysis. Casselberry (Medicine, July, '95).

Literature of '96-'97-'98.

Conclusions from 21 cases in which electrolysis was used as a treatment for deviations, spurs, and ridges of the nasal septum: (a) The results are favorable in most cases, but the method is neither so simple nor so sure as the usual surgical means. (b) It should be limited to those cases in which it is impossible to carry out surgical treatment, either on account of the disinclination or disability of the patient. (c) Electrolysis requires an experienced specialist to carry it out. (d) Cartilage yields more readily than bone. (e) Osteoma is more easily removed than normal bone. (f) Only growths of small size are successfully removed by electrolysis. (g) Perforation and sloughing result from the

use of too-powerful or too-prolonged current. (h) Ten to 27 milliampères of current were used for a time, varying from twelve to twenty-seven minutes. W. L. Ballenger (Jour. Amer. Med. Assoc., Jan. 11, '96).

Much has been written about the advisability of first taking away the mucous covering before excising the cartilage in order not to sacrifice mucous membrane, but thus far attempts in this direction have not been very successful. When the nasal saw is used the patient's head should be turned toward the affected side in order that the convexity of the cartilage may be made as prominent as possible. The beginning of the incision can be made with the saw almost at right angles to the septum. After the cutting has been commenced the saw can gradually be turned so that the teeth are downward. When the cut has been carried down to the sutural line and the bone is reached, time will be saved by finishing the incision with nasal scissors and removing with forceps. Thorough washing of the nose before the operation is required, but after the section has been completed it is better to keep the wound covered with compound stearate of zinc and boric acid for at least two or three days. Attempts to keep the nasal passages in anything like an aseptic condition will prove a failure, and there is much more likelihood of septic symptoms when the nostrils are frequently washed than when the nasal wound is protected by boric acid or some other equally-good germicide.

After using the powder a few days, the nasal passages can be washed and oiled. The scar-tissue at the point of sawing can be made moist and slippery by resorting to massaging with a stimulating disinfectant, such as boroformalin.

I use the cautery or chromic acid only

when there are small points to be reduced. Asch's operation, in which the septum is cut through and forcibly carried to the median line, is indicated when the partition is so thin that it cannot be sufficiently excised and so it becomes necessary to carry the entire septum in the median line. Two different-shaped scissors are employed, the one to cut through the bent septum in a horizontal line, the other at right angles to the first cut in a vertical line; the four points are then pushed through from the convex side into the concave side, so that the redundancy of tissue can overlap in the wider nostril. The entire partition is then forcibly carried to the median line with a large pair of flat-bladed forceps, and the septum is retained with cork or celluloid nasal tubes, which can be removed daily, and the nasal passages cleaned. The bleeding is profuse when the cutting is made, but usually ceases quickly. The nasal tube in the wide nostril is not needed more than a day or two, but is kept in the narrow nostril for two weeks.

There is apt to be a slight rise of temperature the second and third days, and possibly an acute pharyngitis. This operation should not be performed unless there is external deformity which needs correction. It should rarely be performed if sufficient breathing space can be secured by excising a portion of the septum.

Perforation of the septum in adults not regarded as a serious accident, because the supporting structures of the nose are developed and will maintain their position. But in children, where the nasal structures are imperfectly developed and still in the process of growth, perforation of the septum is quite liable to cause a falling in or depression of the top of the nose, and particularly in the cartilaginous portion. The intentional perforation of the sep-

tum, because it is deviated or deformed, should never be resorted to. J. O. Roe (N. Y. Med. Jour., Dec. 1, '94).

Perforations of the nasal septum, situated near the posterior edge of the cartilage of the septum, and of not too great a size, are seldom of any serious pathological importance. There is a class of perforations, however, which is deserving of more attention than has heretofore been given to it, namely: the more or less extensive injuries sometimes produced in the course of operations on the septum, and involving a loss of substance in the vomer. Such an accident is apt to occur during the attempted removal by means of the saw of what appears to be a septal ridge, but what in reality is a sharp horizontal deflection of an unusually thin septum. Instead of a ridge's being removed, a long narrow opening, parallel with the floor of the nose, is made between the two nasal cavities. In several cases coming under personal observation in which this accident occurred, the patient suffered marked symptoms of general shock, quite out of proportion to the apparent importance of the injuries inflicted. Delavan (Jour. of Laryn., Feb., '95).

Literature of '96-'97-'98.

Two hundred operations for deviated septum performed by Asch's method. Of these cases, 85 per cent. resulted in the complete straightening of the septum, while in the remainder some degree of deflection was retained, but in no case was this sufficient to cause any stenosis or discomfort; so that in all a cure may be said to have followed, as far as symptoms are concerned. Perforations of the septum occurred in about 2 per cent. of the cases, but they were only of the size of pin-heads. Mayer (Med. Rec., Feb. 5, '98).

New operation for deviations of the nasal septum consists in sawing a U-shaped flap around the deviation, base upward, then pushing that flap upward into the unobstructed passage so as to break the resiliency of the cartilage, and then allowing it to drop down over the opening like a trap-door. No support by pins or tubes has usually been

required. E. B. Gleason (Phila. Poly-clinic, No. 34, '98).

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NASAL NEUROSES. See RESPIRATORY TRACT, NEUROSES OF.

NASO-PHARYNX, DISEASES OF.

Post-nasal Adenoid Growths (Adenoid Vegetations).

The recognition of this condition has been of inestimable value to humanity. To Wilhelm Meyer, of Copenhagen, is due the credit of having first brought the subject in its clinical and pathological aspects before the medical world.

Symptoms.—Among the earliest symptoms characterizing post-nasal adenoid hypertrophy is obstruction to nasal respiration. The naso-pharyngeal stenosis may be partial or complete, this depending upon the size and position of the vegetations and upon the accompanying inflammation. Even with partial occlusion, however, the patient often finds it more comfortable to breathe, at least partially, through the mouth. Dryness of the throat on waking is often complained of. This is due to the mouth-breathing, and forms the source of various pharyngo-laryngeal disturbances.

Among 4080 patients suffering from affections of the nose, throat, or ear, 426 had adenoid tumors in the vault. Of these 69 per cent. had symptoms of nasal obstruction; 37 per cent. suffered with tonsillitis or pharyngitis; 59 per cent. had ear complications, of whom 110 were cases of suppurative otitis and 142 were cases of deafness without suppuration. Y. Arslan (Jour. of Laryn., etc., Dec., '95).

Still, cases are sometimes seen that breathe with the mouth closed despite the presence of vegetations.

In infants nursing is often hampered in consequence of the obstruction, and

cleansing of the nose is rendered difficult, owing to the fact that the expiratory current is interrupted by occlusion of the upper pharynx.

The voice is usually altered. The impairment is occasioned by an interference of the passage of the waves of sound through the post-nasal space. Stuttering has also been ascribed in some cases to post-nasal obstruction. The tumor sometimes causes a sensation suggesting the presence of a foreign body in the nasopharynx or at the back of the throat which cannot be got rid of by any effort on the part of the patient. Headache is sometimes complained of.

Interesting case in which intense and daily cephalalgia of twenty-three months' standing, and which had resisted all treatments, was found to be due to adenoid vegetations and turbinate hypertrophies. Removal of the former and galvanic cauterization of the latter brought about complete recovery. Ménière (Revue Men. de Laryn., etc., July, '88).

Associated with adenoid vegetations is a condition known as *aproxexia*, or lack of ability to concentrate attention. Sleep is often disturbed and the child grows "nervous" and irritable. Attacks of suffocation during sleep occur occasionally, out of which the patient is aroused exhausted and in a state of profuse perspiration. The mouth-breathing is usually noisy, and snoring is not infrequent. Night-terrors are sometimes witnessed. Enuresis is often traceable to post-nasal growths.

Literature of '96-'97-'98-'99.

As to whether enlarged tonsils and adenoids produce enuresis the following conclusions are reached: 1. In 350 cases of enlarged tonsils enuresis was present in 104. 2. But only 157 out of these 350 were pure tonsillar cases; the remaining 193 were complicated in some form or other. 3. Of the uncomplicated 157 cases

only 26 had enuresis, while in the other 193 cases enuresis was found not less than 78 times. 4. In complicated cases of enlarged tonsils and adenoids, enuresis occurs at the rate of 40 per cent.; in uncomplicated cases at the rate of about 16 per cent.

Notes found of 23 cases in which the tonsils had already been removed and who from five to nine months after the operation developed enuresis, some 5 without any apparent cause, the other 18 during convalescence from acute infectious diseases. These cases have not been included in this paper. Ludwig Freyberger (Treatment, Mar. 9, '99).

Cough due to laryngeal irritation brought on by constant buccal breathing usually persists as long as the nasopharyngeal vault remains occluded.

Literature of '96-'97-'98.

Children in whom adenoids exist are more susceptible to croup, laryngitis, bronchitis, and pneumonia. F. A. Botome (N. Y. Med. Jour., May 22, '97).

Deafness or impaired hearing in early life without doubt has its source in post-nasal adenoid hypertrophy in the majority of cases. Normal or perfect ventilation of the tympanic cavity is impeded, which condition may ultimately lead to retraction of the membrana tympani and induce tinnitus aurium. The cause and course of chronic otorrhœa to which so many children are subject, especially those of the scrofulous or tuberculous temperament, are very frequently referable to adenoid vegetations. Inflammatory states of the lymphoid tissue induced by exposure to temperature-changes or the exanthematous diseases generally produce catarrhal affections of the Eustachian tube or of the mucous membrane lining of the tympanic cavity, which may end in a chronic suppurative process of the middle ear, accompanied, as the case may be, by mastoid complication. Frequently an earache is the result of press-

ure exercised on the Eustachian cushion or orifice by adenoid growths, causing hyperæmia and irritation of the tube.

Out of 565 cases treated for naso-pharyngeal affections, diseases of the middle ear were found in 197. Of the whole number, 134 had hypertrophy of the third tonsil, of whom 62 had impaired hearing. White (Jour. Amer. Med. Assoc., Aug. 3, '89).

Deafness found in 90 per cent. of children having adenoids. A. Bronner (Brit. Med. Jour., Sept. 13, '90).

Of 160 deaf-and-dumb patients, 57.5 per cent. had adenoid vegetations of the pharynx. Wróblewski (Inter. klinische Rund., Oct. 11, 18, '91).

Of 415 young deaf-mutes, 79 were found to have adenoid vegetations of the vault, causing partial occlusion of the cavity or pressure upon the Eustachian openings. Arthur A. Bliss (Med. News, Nov. 19, '92).

Literature of '96-'97-'98.

Out of 500 cases, 304 were more or less deaf, while in 196 the hearing was normal. Of these 304, 22 were deaf in one ear only. The most common form of ear complication is undoubtedly Eustachian obstruction, occasionally associated with the presence of free exudation in the middle ear. In 98 cases there were, however, evidence of past or present middle-ear suppuration. In 25 instances earache was a prominent symptom. The hypertrophied pharyngeal tonsil probably acts (1) by causing obstruction of the Eustachian tube, (2) by interfering with the circulation [lymphatic or vascular] of the middle ear, and (3) by acting as a *nidus* of infection in suppurative cases. P. McBride and A. Logan Turner (Edinburgh Med. Jour., May, '97).

Blood sometimes appears in the mouth or on the bed-clothing during sleep; this is occasioned through the friability and vascularity of the growth, rupture of the tissue being easily induced by slight mechanical interference either by the action of the soft palate on the vegeta-

tions or by friction between the growths themselves.

Case of a boy, aged 10 years, in whom hæmatemesis was due to adenoid vegetations. The neoplasms were removed with the finger-nail, and no hæmorrhage has occurred since. H. Drinkwater (Brit. Med. Jour., June 24, '93).

Case of same kind. P. Macleod Yearsley (Brit. Med. Jour., July 22, '93).

Laryngitis stridulus, or so-called "false croup" or spasm of the larynx, an affection suddenly manifesting itself some time after midnight and causing alarm, is mainly ascribable to naso-pharyngeal occlusion and buccal respiration. The larynx becomes dry and hyperæmic, which in a neurotic individual produces reflex phenomena.

Among other reflex conditions referable to post-nasal growths are choreiform movements of the soft palate accompanied by a peculiar clicking noise, audible at a considerable distance from the patient and occurring at intervals of one second. I witnessed a case of this character cured by a thorough removal of the naso-pharyngeal lymphoid mass. I also witnessed wryneck as a complication in three cases. Prolonged buccal breathing incident to retronasal obstruction may also lead to chronic enlargement of the faucial tonsils and prominence of the palatine arch.

In adults many symptoms characterizing the disease in childhood are present and, in a great measure, give rise apparently to similar disturbances, among which chiefly to be noted are catarrhal states of the neighboring mucous membranes, dry pharyngitis, and chronic naso-pharyngitis.

In 268 children examined in New York, 63, or 24 per cent., had adenoid vegetations, associated with which were 32, or 50 per cent., of enlarged tonsils, and 29, or 46 per cent., of some anterior

nasal obstruction. Hopkins (Pacific Med. Jour., Sept., '92).

In 77 cases of adenoid vegetations the hard palate was normal in only 10 cases. In 67 cases there was some abnormality, and in 10 the palate exhibited signs of rickets. In the remaining 55 abnormal increase of the arch observed, a section through it forming either a polygon or a Gothic arch. Grönbech (Hosp.-tid., No. 10, '93).

Literature of '96-'97-'98.

Three cases of torticollis due to adenoid vegetations and chronic hypertrophy of the nostrils, relieved by operations upon these tissues. A. J. Gillette (N. Y. Med. Jour., Aug. 1, '96).

Objectively considered, the symptoms of post-nasal adenoid growths are most characteristic. The significant clinical signs are the dull, heavy, and stupid facial expression of the patient, the pinched nose or indrawn alæ, the depressed inner canthi, the elevated eyebrow, the corrugated skin of the forehead; the distorted or deformed thorax, or what is called "pigeon-breast"; the apparent mental deficiency, the decidedly affected speech, the impaired or retarded general physical development of the patient, etc.

Literature of '96-'97-'98.

Voluminous adenoids are commonly found in cases of scoliosis, and it is likely they are related as cause and effect, especially as removal of them early suffices of itself to bring about cure of the condition. In the most serious cases removal of the adenoids should precede orthopædic measures where the latter are necessary to supplement the former. The deformity known as hour-glass thorax is due to trophic disturbances from microbe-infections' gaining access by way of the adenoids. Finally, the coincidence of certain forms of tuberculosis with adenoids regarded as due to the germs' gaining access through the adenoids. Their early removal would

obviate such infection. Bilhaut (Bull. Méd., June 26, '98).

Adenoids as an etiological factor in orthopædic deformities. Granted that adenoids have some connection with orthopædic deformities, what can that connection be? 1. Both adenoids and deformities might be an expression of degeneracy. 2. Deformities might occur as a direct result of mechanical obstruction to breathing. 3. Orthopædic deformities occur in tubercular joint disease, which may have had their source of infection either directly or indirectly from adenoid vegetations. 4. Deformity may result directly from reflex irritation of the neighboring nerves by adenoid growths. 5. Lastly, and most important, adenoids may cause such a lowering of the general nervous vitality that they may be considered almost the direct cause of some of the atypical orthopædic deformities whose etiology is unknown. F. S. Coolidge (Medicine, July, '98).

Anæsthesia of the soft palate and the pharynx is sometimes a noticeable feature of mouth-breathers. Such patients usually are easily managed and offer but slight resistance when operating on the throat or naso-pharynx. Cleft-palate patients usually have hyperplasia of the lymphoid tissue at the vault.

The velum palati sometimes suffers markedly. It sometimes becomes thickened as a result of follicular glandular swelling or from œdema, occasioned by constant mouth-breathing and local irritation of the parts. When such a state of the palate prevails, free movements of the organ are impeded and the voice assumes a weak, dull, monotonous tone which may continue to be present even after the naso-pharynx has been freed. In fact, paresis of the palate is thus produced, dependent evidently upon the chronic congestion of the palatine glands and muscular tissue. Inflammation of the lymphatic glands in the neck is sometimes witnessed.

On examination of the throat and naso-

pharynx the mucous membrane of the fauces may be found swelled, the uvula drawn to one side, and the faucial tonsils diseased. The naso-pharyngeal cavity may contain a greenish mucus, tough and difficult to remove, which at the same time may run down the posterior wall of the pharynx. Sometimes the secretion remains confined and becomes offensive owing to decomposition. In adults post-nasal accumulations are apt to take place and become dry during the night, which in the morning creates nausea and hawking.

Nutrition of the patient is almost always more or less disturbed. The child becomes anæmic. The percentage of hæmoglobin is materially reduced, sometimes to 35 per cent. The red cells diminish very much in number.

That infectious diseases, such as scarlet fever and diphtheria, become more virulent and dangerous when post-nasal lymphoid tissue exists is not to be doubted. Adenoid tissue seems to furnish an inviting soil for the development of bacterial life, and it is also endowed with the power of absorbing infectious matter.

Diagnosis.—The diagnosis is quite easy when the general aspect of the patient is taken into consideration. The clinical picture of adenoid vegetations in the majority of cases is significant.

Literature of '96-'97-'98.

Conditions which may simulate adenoid diseases by causing mouth-breathing are any obstruction in the upper air-passages above the uvula; deviations, spurs, and ridges of the septum; weakness and falling of the alæ; catarrhal secretion which children neglect to blow out, and which adheres to, and stops up, the nose; chronic eczema of the anterior nares, with formation of crusts, which block the nostrils. It is not very common to find the openings of the nostrils too small. The specific

snuffles of infants may simulate adenoid disease. John A. Farlow (Boston Med. and Surg. Jour., Apr. 21, '98).

The rhinoscopic mirror should invariably be used, and, if its employment becomes impracticable, resort should be had to the digital method of examination, which is perfectly safe and easy, no previous preparation being required.

Digital exploration of the cavity gives the surgeon an idea as to the situation, size, and extent of the growths and how much of the retronasal space is involved in the morbid process. Information is also obtained regarding the consistence of the vegetations: *i.e.*, whether they are soft and friable or firm and fibrous. Sometimes more or less hæmorrhage is induced by the examination. Certain precautions should always be observed: The finger must be rendered absolutely aseptic; this is readily done by the use of soap and water and immersion in absolute alcohol and then in carbolized oil. In order to obviate injury to the finger by the teeth of the patient a metallic guard can be used, or, what is better still and more convenient, a piece of sterilized gauze wrapped sufficiently thick around the finger. The mouth-gag is preferred by some operators. The patient should be held and the head properly supported by an assistant.

Routine employment of palpation of the naso-pharynx recommended as superior, in many ways, to posterior rhinoscopy. The necessary relaxation of the palate is secured by the pronunciation of the French "on." Ziem (Ther. Monats., Dec., '92).

If the patient is sufficiently old, a 2- or 5-per-cent. solution of cocaine, sprayed or brushed over the throat, may be used to diminish irritability. Frequently enlarged faucial tonsils are present which prevent a good view of the naso-pharynx.

When this is the case the tonsils should be excised before proceeding further.

Occasionally the space between the soft palate and the posterior wall of the pharynx is so small that illumination of the cavity above becomes impossible. Then, again, in rare instances post-nasal inspection with the mirror is facilitated by retracting the palate with a proper instrument. Yet, generally speaking, children do not tolerate such a procedure. The parts to be examined with the rhinoscopic mirror are the upper margin of the posterior nares or the choanæ, the vault and posterior wall of the post-nasal space. Chiefly concerned in the production of the affection are the upper part of the posterior wall and the highest point of the roof. Sometimes, however, the growth occupies a position far forward in the naso-pharynx, encroaching upon the turbinal structures.

Rosenmüller's fossæ and the spaces between the Eustachian cushions and the roof of the pharynx are sometimes the seats of the vegetations. Indeed, adenoid growths in Rosenmüller's fossæ exercise a greater interfering influence over the Eustachian patency than can be imagined. Unilateral deafness may be traced to this (Gibson). One of the most frequent forms of the disease to be seen by direct inspection is a cushion-shaped body generally situated in the median line of the vault, sometimes extending anteriorly toward the choanæ or posteriorly over the upper half of the pharyngeal wall. The free surface of this tumor may be smooth or corrugated. Its color, when the growth is not acutely congested, usually is a pale pink. Yet it may be intensely red.

The next variety are lobulated masses separated by a central depression that sometimes makes it appear as if two distinct tumors were present, yet which,

after removal *en masse*, are found to have a common base.

Not infrequently a number of these separate growths are closely packed together and suggest the existence of but one mass. Then, again, the mucous membrane of the entire vault or of parts of the post-pharyngeal wall are studded with numerous adenoid excrescences.

The surface is never granular, though sometimes coarsely lobulated; no vessels are visible on the surface, as frequently happens with retronasal polypi. In adults, where the growths have undergone partial atrophy, they may appear as distinct excrescences studding the posterior wall, the vault, and even the lips of the Eustachian tube.

Literature of '96-'97-'98.

From fibrous tumors the following points serve to distinguish adenoids, viz.: (1) on rhinoscopic examination the latter are not sharply defined; (2) on palpation they feel soft. Malignant tumors in this situation are not common in any class of patients, and least so in children; they are usually associated, when soft, with frequent and violent hæmorrhages, while other grave symptoms speedily ensue. In children who show evidence of an inherited taint the possibility of adenoids should be borne in mind. P. McBride and A. Logan Turner (Edinburgh Med. Jour., May, '98).

Occasionally bridges of tissue extend from the adenoid growths to the posterior lip of the Eustachian tube.

This condition is invariably a source of aural disturbance. The band of tissue seems to be of the same nature as that of the lymphoid growth. In adults, in whom the post-nasal growth has almost wholly disappeared as a result of atrophic process, Rosenmüller's fossæ still seems to be occupied by adenoid tissue.

Etiology.—Adenoid vegetations are

common and especially peculiar to childhood. They pre-eminently characterize early life and sometimes affect several members of one family at the same time.

Sajous states that heredity is an important etiological factor in many cases, and that in this country adenoid growths seem to be oftener prevalent among females than males.

Literature of '96-'97-'98.

In 2000 patients, 858, or 42.9 per cent., were the subjects of disease of the tonsils (faucial, pharyngeal, and lingual), and thereby induced to seek relief from the symptoms for which they were in all cases partially, and in many instances wholly, responsible. Enlargement of these tissues is somewhat more common in the female sex. In hypertrophy of the lymphoid material at the base of the tongue the female shows a very decided preponderance over the males. Up to the fifteenth year the males suffering from adenoids are slightly more numerous than females (238 to 209); after this period, however, the proportions are directly reversed, and continue so. In hypertrophy of the tonsils alone the proportions up to the fifteenth year are practically the same; afterward the number of females is more than double that of males. Of the 2000 patients, 1123 were females and 887 males. In 2000 observations the following percentages were found:—

Of adenoids alone.....	18.40
Of adenoids and tonsils.....	16.65
	—
	35.05
Of tonsils alone.....	5.05
Of hypertrophy of the lingual gland	2.80
	—
	42.90
H. Arrowsmith (N. Y. Med. Jour., Aug. 28, '97).	

The abundance of lymph-follicles in the retronasal space of children affords an explanation for the frequent appearance of the disorder in early life. The

disease may be present at birth or it may commence during the first or second year.

Between three and fifteen years seems to be the period of life in which the disease is most common. Yet, as a general rule, the third year is the time when evidences of post-nasal adenoid hypertrophy become manifest. Adult life is by no means exempt from the trouble, for it is not an unusual thing to see persons whose ages range from eighteen to thirty-five years, or even more, suffer from the disorder.

The prevailing belief that adenoid vegetations are never present after the thirtieth year is shown to be incorrect by the case of a man, aged 65, who was operated upon for a marked unilateral deafness. Couetoux (*Revue Gén. de Clin. et de Théor.*, Dec. 13, '88).

Case of adenoid vegetations in a lady of 70, otherwise healthy, except for the presence of an enlarged thyroid gland. J. Solis-Cohen (*Jour. of Laryn.*, Feb, '89).

Of 32 cases examined for adenoid vegetations, 17 were in patients from 5 to 14 years. A. Michel Dansac (*Annales des Mal. de l'Oreille*, etc., July, '93).

Six cases in nurslings under six months old, one of these being but one month of age. Huber (*Archives of Ped.*, Jan., '94).

Literature of '96-'97-'98.

As the total result of examination of 500 cases of adenoids the conclusion reached that adenoids are most commonly met with between 6 and 15, but that they are fairly common under 5 years and between the ages of 15 and 20. Sex seems to exercise a very small influence, the figures being 263 males and 237 females. Heredity has a very considerable influence. Out of the 500 cases there were thirty patients who had either one or more brothers or sisters affected in the same way; in nine instances there were two only, and in four there were three members of the same family affected. Damp atmosphere

favors the occurrence of symptoms in those who have hypertrophied pharyngeal tonsils, while opposite conditions tend to diminish the nasal obstruction when it exists. Among deaf-mutes it has been shown that adenoids are much more frequent than among other children. P. McBride and A. Logan Turner (*Edinburgh Med. Jour.*, Apr., '97).

Lymphoid tissue in childhood is very easily excited into active growth, the faucial tonsils and cervical glands taking on active inflammation under trifling influences. Chronic hypertrophy is chiefly brought on by repeated or continued inflammations of the tissue.

The amount of tissue sufficient to produce marked symptoms of hypertrophy in children does not cause similar conditions in adults, because as adult life is approached the naso-pharyngeal cavity increases its dimensions, thus overcoming by degrees the amount of obstruction. Not infrequently only remnants of the disease in the form of irregular thickenings of the mucous membrane are found in adult age, which predisposes to acute exacerbations of post-nasal catarrh. The predisposition of adenoid growths as the individual grows older is to atrophy and disappear spontaneously.

The disappearance of adenoid vegetations before the age of 20 years is by no means so constant as most descriptions of the subject imply. In young adults (25) the structure is identically the same as in children. In older subjects there is an increase of fibrous tissue. Luc and Dubief (*Archives de Laryn.*, etc., Aug., '90).

The researches of Meyer have demonstrated that adenoid vegetations occur in all climates and affect people of all nations. A damp, cold climate seems to favor more especially their production.

The rheumatic or strumous diathesis seems to predispose to their development. Acute catarrh of the nose and naso-

pharynx, such as is often induced by acute coryza, is unquestionably accountable for the excessive development of the tissue in many instances. Undue development may also be produced by septic disturbances of the lymphoid tissue. This accounts for their appearance as a sequel to exanthematous diseases after scarlet fever, measles, whooping-cough, etc., when the cause of the hypertrophy is traceable to the action of a pathogenic organism. The tubercle bacillus may find a soil in the hypertrophied tissues.

Proportion of adenoids which are tuberculous is 1 in 17. Lermoyez (*Presse Méd.*, Oct. 26, '95).

Only once has tuberculous angina been personally noted to develop after the removal of adenoid vegetations. After this case, specimens from one hundred consecutive patients were sent to Pilliet, but in no case did the microscope reveal tuberculosis. Broca (*La Presse Méd.*, Nov. 6, '95).

Literature of '96-'97-'98.

Specimens removed from a hundred patients carefully examined for histological evidence of tubercle, with the result that in 3 per cent. such evidence was found. Great numbers of other organisms were also found, not only lying upon the free surface of the hypertrophy, but also in the crypts. These are chiefly micrococci, though short bacilli are also present in some of them. There is abundant evidence, therefore, of the presence of micro-organisms associated with the hypertrophy of the pharyngeal tonsil, and the dangers that may arise from this source should not be lost sight of in the clinical consideration of each individual case. P. McBride and A. Logan Turner (*Edinburgh Med. Jour.*, May, '97).

From examination of 213 cases of adenoid vegetations, the conclusion reached that there is no bactericidal property in the secretion of the glands, and probably none in the nasal mucus. Latent lacunar encysted adenoiditis is a rarity. As regards the bacilli, 25 examinations dis-

closed none; 37 streptococci, but never pure; 60 staphylococci, pure, and 69 associated with other micro-organisms; other forms of cocci, 41 pure and 54 associated; pneumococci, 3; leptothrix buccalis, 1 pure and 1 associated; and a short bacillus not taking Gram's stain in 1 case. There was hypertrophy of the tonsils in 17 cases; tuberculosis, collateral in 30, hereditary in 18, and personal in 17, but Koch's bacillus was never detected in the vegetations. Goure (Thèse de Paris, No. 175, '97).

Influenza is often responsible for post-nasal adenoid hypertrophy. The growth sometimes, as a result of congestion and inflammatory infiltration, becomes enormously enlarged, sufficiently so as to occupy the whole naso-pharyngeal vault, totally obstruct the posterior nares, and cover to a greater or less degree the orifices of the Eustachian tubes.

Occasionally, in cases where the adenoid growth involves the lateral and posterior walls of the naso-pharynx, the enlarged lymphoid mass may be present below the velum palati or become quite visible whenever the mouth of the patient is widely opened.

Pathology.—Post-nasal adenoid growths undergoing hypertrophic changes resemble in structure the tonsils of the fauces when similarly affected. Microscopically examined they are found to consist of a retiform net-work of connective tissue filled with lymph-corpuses. The growths are richly supplied with blood-vessels and are covered with a layer of ciliated epithelium, resembling more or less the mucous membrane from which they take their origin. Adenoid vegetations assume various appearances. Frequently they project anteriorly as excrescences or small bodies or clusters of vegetations, distributed over the vault or the posterior wall of the pharynx. Sometimes they hang from the roof in the form of elongated or stalactite-like

masses, veiling at the same time the posterior nares or the mouths of the Eustachian tubes. Then, again, but one cushion-like mass, whose surface is corrugated, pale, red, or purple, may be found.

This form is common. The vegetations when soft are quite friable and easily removed, while, on the other hand, when firm in texture their attachment is strong and removed with more or less difficulty.

Chronic hypertrophic rhinitis, chronic follicular pharyngitis, or chronic enlargement of the faucial tonsils is very often intimately associated with post-nasal adenoid hypertrophy. The aural complications are due to an exudative inflammation or abscess of the middle ear.

As has been mentioned, the tendency to atrophy and disappear spontaneously is the history with puberty. This change probably is favored by the action of mechanical processes. During this period the fibrous structure of the tumor also changes, thus causing ultimate obliteration of the blood-vessels and lymph-duets in consequence of pressure and constriction of these vessels. The quantity of blood-supply becoming lessened, the lymph-cells gradually diminish in number and glandular atrophy results.

Teachings of embryology suggest that pharyngeal structures are related intimately to encephalic structures by means of the pituitary and pineal bodies; and pathology has already associated morbid states of the pituitary body with general nutritive processes. Adenoid growths, while, as a rule, acting mechanically, will occasionally manifest the symptoms of a veritable disease which is allied to other affections of the blood-vessel, gland, and lymph systems, and which should be regarded as having a dominating influence on metabolic processes. It is thus placed in alliance with acromegaly and myxœdema. Harrison Allen (Med. News, June 22, '95).

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Histological examination showing: 1. That the ciliated epithelium may be converted into the stratified squamous variety, and the latter become much thickened, as the result of the intermittent pressure to which the hypertrophy is subject. 2. That this change tends to occur in the smaller naso-pharynx of the young child. 3. That the cilia may become destroyed over large areas, and the epithelium thinned to a varying degree; and, further, that migration of leucocytes is not general. 4. That there is a tendency to an overgrowth of fibrous tissue, which commences in and around the blood-vessels, and, gradually invading the lymphoid tissue, leads to shrinking of the growth. 5. That this process is not confined to the period at or after puberty, but occurs also in very young children, and is, therefore, independent of the age of the patient. P. McBride and A. Logan Turner (Edinburgh Med. Jour., Apr., '97).

Prognosis.—The prognosis of post-nasal adenoid growths from the standpoint of treatment is, in the majority, of cases satisfactory. But, when the disease is allowed to remain unrelieved and pursue a natural course, the consequences incident to these growths are sometimes so far-reaching that they cannot be repaired either by Nature's process or the physician's aid.

Very much depends upon the age of the patient. If the disorder is recognized in early life or at the time when the symptoms are most pronounced and before local or systemic complications set in, operative interference arrests the course and duration of the malady. In a given case of a child or youth suffering from adenoid vegetations it is almost always safe to advise parents in the following manner: 1. That complete removal of the growth restores nasal respiration. 2. That the tendency to take colds in the head, accompanied by sore throat or

bronchial cough, will be lessened. 3. That reflex conditions will disappear. 4. That snoring will diminish. 5. That mental and physical vigor will become increased. 6. That chest-deformity will usually subside. 7. That impaired hearing will be remedied. 8. That restlessness during sleep will become modified. 9. That general malnutrition and anæmia will become improved.

On the other hand, in adults where serious ear disturbances—such as chronic otorrhœa, deafness, tinnitus aurium—are the result of long-continued post-nasal stenosis, a guarded prognosis must be given.

In cases of epilepsy or asthma directly traceable to the presence of naso-pharyngeal adenoid growths it always is the part of wisdom to promise but little from treatment, though one is forced to entertain the belief that nasal obstruction is, in a great measure, connected with the origin of the paroxysm.

Treatment.—Cases are occasionally met with that do not present the usual clinical aspects of the malady. They show but slight embarrassment to nasal breathing during attacks of coryza, a proneness toward sore throat and some enlargement of the faucial tonsils, and a moderate manifestation of nervous involvement. Further than these evidences perhaps nothing more is present indicating the existence of the affection.

An immediate operation in these mild forms should not, as a rule, be insisted upon if opposition is offered by parents and friends. The patient should be kept under observation, the behavior of the growths and the effect catarrhal conditions of the naso-pharyngeal cavity have upon them being closely watched. Change of climate or of environment often has a salutary effect; complications are thus warded off. Should it, however,

be ascertained that the vegetations have a tendency to develop, threatening obstruction, and affect the mucosa of the neighboring organs, radical removal is indicated. Under practically all circumstances, however, early and complete removal of the growths is rational and absolutely justifiable when it is remembered that topical and internal applications of remedies have little or no effect.

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The contra-indications to removal of adenoid vegetations are hæmophilia, anomalies of the arteries in the naso-pharynx, and during family epidemics of whooping-cough, measles, or influenza, and cases in which an acute or subacute catarrhal condition of the respiratory passages is present. M. Helm (*Soc. Française d'Otol., de Laryn., et de Rhin.; Univ. Med. Jour., June, '96*).

Whenever, in a person with adenoids, there is a constant tendency to cold-taking or there is a chronic laryngitis or bronchitis, and the patient is under thirty, one should not hesitate to operate, and that with a most favorable prognosis. Whenever there is paroxysmal sneezing or hay fever, spasmodic asthma or laryngismus stridulus, headaches, chorea, epilepsy, one need not scruple to operate, although the prognosis must be guarded. Finally, whenever there is a distinct flattening of the lower part of the thorax on one side or both sides, or depression of the costal cartilages or prominence of the sternum, one would probably be right in operating, although there may not be much indication of general malnutrition. The absence of buccal respiration is no indication against imperative necessity for operation. In a singer with a small hypertrophy of the pharyngeal tonsil, even when it is of absolutely no pathological importance, removal should be urged. Greville Macdonald (*Jour. of Laryn., Rhin., and Otol., June, '97*).

Certain constitutional conditions sometimes exist indicating the use of cod-liver-oil or some other form of the so-

called reconstructives. The tuberculous or scrofulous diathesis is the condition chiefly requiring such assistance. After the occlusion of the naso-pharynx has been overcome these cases seldom require internal medication, as the improved respiration soon revives the powers of nutrition and gives renewed vigor to the individual.

Chemical caustics and the electrocautery came into vogue soon after Meyer and Löwenberg recommended a purely surgical procedure. If for no other reason than the mere fact that the use of these destructive agents excite an undue and sometimes unmanageable septic reactionary effect, involving the Eustachian and tympanic structures, they should be discarded. Their employment is inefficient and dangerous.

The operative method is universally employed at present. The instruments first devised for post-nasal adenoid operations were the ring-knife of Meyer and the cutting forceps of Löwenberg; the latter of which, or modifications of it, are still used by many operators. Unscientific and septic as the method may seem, the sharp forefinger-nail used as a curette, at one time quite popular, still holds a position of usefulness in the performance of these operations. But its sphere is limited and the method cannot be relied upon for thoroughness because experience teaches that recurrence of the symptoms, in the majority of instances, is very apt to occur. Repetition of the procedure is also often necessary. It is only in those cases where the vegetations are soft and not very abundant that the finger-nail operation proves satisfactory. Its utility lies principally in the means it affords in clearing away shreds of tissue that remain after the employment of the forceps or the curette. Adenoid tissue, for example, occupying Rosenmüller's

fossæ, recesses into which cutting or scraping instruments cannot satisfactorily be carried, can always be removed in this way. Sometimes after curettement fringes of vegetations veiling the posterior nares and hanging, as it were, from the upper margin of the choanæ, remain and still cause obstruction or furnish a point for redevelopment of the growth. These shreds can be more conveniently got rid of with the finger-nail than by any other means. The nail must be made sharp and aseptic. Before passing the finger into the naso-pharynx it should be immersed in absolute alcohol for a few minutes, which hardens the nail and also aids in freeing it of bacteria. An artificial finger-nail constructed of steel and fitted to the finger is recommended by some operators. The method is not practical nor satisfactory.

The form of instrument most frequently used is Gottstein's curette. Many modifications of this instrument have appeared from time to time. The curve of the blade and of the shank seems to especially adapt the instrument to the anatomical disposition of the parts over which it must be passed.

Every practical operator will not be content with the possession of one form only; he will have at hand different sizes with various shapes so as to enable him to make a selection suited to the case in hand. Useful as the Gottstein curette is, still it must not be forgotten that its application is not unattended with danger, especially in the hands of the inexperienced operator.

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Of the numerous and varied instruments the blunt forceps is the most efficient. Two principles should govern all these operations: the most thorough extirpation of the growth, with a minimum of shock, pain, or injury to the

patient. There is a certain amount of post-operative shock, requiring greater caution than is usually employed in the after-care of the patient. D. B. Delavan (N. Y. Med. Jour., Oct. 29, '98).

There is no infallible method for the removal of adenoids. Different methods suit different cases. Judgment must be used in the individual case. There should be some adenoid tissue in the naso-pharynx. Atrophy and cicatricial contraction may occur from too thorough removal. Randall (Phila. Med. Jour., July 9, '98).

The intent of the curette is to lift *en masse* the lymphoid tissue from its attachment by a clean, free cut. Gottstein's curette is a cutting, not a scraping, instrument. On no occasion should it be introduced into the naso-pharyngeal cavity in a dull state. Otherwise the



Blade of the Gottstein curette.

tissues may become mutilated and a grave injury to neighboring organs or mucous membrane result. An accident known to have taken place is the detachment, or stripping-off, of the mucous membrane of the pharynx.

In drawing the curette backward and downward the instrument must be held firmly and guided so as to sweep the curve unimpeded.

In order to obviate interference with adjacent structures only sufficient pressure and force must be exerted as will excise the growth and nothing more. The cutting edge of the curette must never be carried downward on a direct line with the posterior wall of the pharynx; it must be caused to follow the course of the circle described by the naso-pharyngeal curve, the concavity of the blade at the com-

pletion of the operation presenting underneath the palatine arch, with the uvula appearing in the fenestrum of the instrument.

If the operation is done in the manner indicated the existent collateral vegetations, as those in the fossæ of Rosenmüller or along the lateral walls of the naso-pharynx, which were not brought within the grasp of the curette, can be taken away with the finger-nail, the operation being performed under the influence of a general anæsthetic. When without anæsthesia, the naso-pharynx previously having been illuminated, then Hooper's post-nasal cutting forceps can be used.

Preferred treatment of adenoids almost always: removal by cold wire-snare introduced through the nose and controlled by means of posterior rhinoscopy. Through the nose the nares are cocaineized before operation. Bleeding is slight; pain is absent or insignificant. Of 163 private cases operated on solely by the snare, 66 were cured in one sitting, 56 in two, 33 in three, 7 in four or five, and 1 in nine. This procedure is absolutely free from danger, causes slight bleeding, is followed by no reaction, is free from pain, and can be applied under cocaine anæsthesia. Chiari (Wiener klin. Woch., June 7, '94).

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New method by which the naso-pharynx can be exposed to direct examination: The patient reclines on a couch with the head well thrown back; the operator then takes hold of the tongue and instructs the person under examination to breathe quietly, while he introduces a hook with which the soft palate is drawn forward, at first very gently and afterward more energetically. The operator is then able to perceive the whole surface of the naso-pharynx. It is possible by employing this method (1) to operate directly, without using a mirror, on naso-pharyngeal tumors, and (2) to catheterize the Eustachian

tube by the aid of direct vision. Katzenstein (Archiv für Laryn., Jan., Feb., '97).

Complications accompanying the "cutting away" of adenoid tumors are: tearing away of mucous membrane of the pharynx; removal of the basilar apophysis (Castex); death from hæmorrhage (Delavan and Schmiegelow); dropping of tumor into the laryngeal cavity and causing suffocation. Instances have been reported where teeth have been broken by improper manipulation of the curette and where the cutting-blade itself was broken and pieces swallowed by the patient (Castex). Convulsions also have been reported as a complication of the operation. It not infrequently happens that the ablated growth is swallowed by the patient after the use of Gottstein's curette. To obviate this occurrence a device was added to the instrument by Delstanche by means of which the growth is held within the fenestrum, thus preventing its dropping into the throat. Considerable bleeding usually takes place immediately after curettement, but this seldom requires special attention.

Series of 1000 cases of adenoid growths of the pharynx operated upon by author. Growths removed with Gottstein's ring-knife. In no case was there severe bleeding. Max Schaffer (Deutsche med. Woch., July 16, '91).

Death from convulsions after removal of adenoids in a nervous and anæmic boy, whose naso-pharynx was scraped under a 10-per-cent. cocaine solution. Sanford (La Sem. Méd., vol. ii, No. 29, '94).

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On three occasions in operations for adenoids a narrow prominent bony growth was encountered in the middle line that corresponded to the anterior surface of the atlas, and supposed to be due to increased development of the anterior tubercle. Kahn (Rev. de Laryn., Apr. 3, '97).

The immediate dangers in operating

for adenoids are (1) of entrance of blood and the formation of a clot in the larynx, thus asphyxiating the patient, and (2) of damage to the Eustachian tubes and the setting up of an otitis. To avoid the first, operators are content with the precaution to keep the head lower than rest of the body, and the face downward. Where this has been done no report of fatalities recalled. J. E. Brown (*Columbus Med. Jour.*, Nov. 9, '97).

Case of fatal hæmorrhage from the removal of adenoid vegetations occurring in the practice of a surgeon who had often done the operation without mishap. The patient, a boy, 12 years old, showed nothing strikingly abnormal beyond a pronounced adenoid habitus and serofulous glands in the neck. Operation was done without anæsthesia, and the ordinary Gottstein annular knife used. Without any warning, a sudden gush of arterial blood issued from the mouth and nose. In spite of prompt tamponing and subcutaneous and intravenous saline injections, death occurred in a few minutes. The internal carotid artery was found to have been opened just in front of its point of entrance into the carotid canal of the pars petrosa ossis temporis. Swollen glands had probably pushed the vessel forward, so that the pressure of the knife caused its rupture, for it was not cut. Schmiegelow (*Monats. f. Ohrenh.*, No. 3, '97).

Case of fatal secondary hæmorrhage on the eighth day following the removal of adenoid vegetations. Patient, who was eleven years old, gave no history of a bleeder, but it was noticed the blood from the first bleeding was only partly clotted. Wallace Preble (*Boston Med. and Surg. Jour.*, May 19, '98).

An instrument devised to take the place of the curette, a post-nasal guillotine, has been devised by the writer. It is constructed in such a manner as to accomplish all that is claimed for the curette without causing injury to the organs adjacent to the adenoid tumor requiring removal. Another advantage claimed for it is simplicity of technique. In introducing the guillotine into the

naso-pharyngeal space no difficulty is experienced, the curved blade being carried into the vault in the same manner as the curette. By keeping the instrument in the median line of the roof and exercising such pressure as will force the blade upward and forward the tumor is brought within its grasp and readily excised by drawing from before backward the guarded knife.

The question arises: will hæmorrhage follow an operation with the guillotine more readily than when the cutting forceps or the curette is employed? Experience teaches that it does not. In hæmophilias hæmorrhage is always liable to occur regardless of the method employed; simple palpation of the adenoid tissue has been followed by fatal bleeding (Delavan). Secondary hæmorrhages of a violent nature have taken place after the removal of the post-nasal adenoid growths.

[Two cases of this character are recalled in boys, respectively, 8 and 9 years of age. Apart from the adenoid disease they were apparently well. One week after the operation (by Gottstein's curette) persistent bleeding set in, which could only be brought under control by forcibly tamponing the post-nasal space. Hinkle reports a case of hæmorrhage of an alarming character controlled apparently by applying to the bleeding surface the gummy substance formed by the combination of antifebrin and tannic acid in solution. JACOB E. SCHADLE.]

Is recurrence liable to take place after the removal of adenoids? Not as a rule, provided the operation has been skillfully done and complete removal accomplished.

Recurrence of adenoid vegetations after their removal is more frequent than is usually supposed; thus necessity of complete removal. F. E. Hopkins (*N. Y. Med. Jour.*, Jan. 26, '95).

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The recurrence of the growths in young children sometimes witnessed is

due to the greater difficulty in effecting complete removal in them and the greater predisposition to the proliferation of lymphoid tissue under slight provocation. Dundas Grant (*Jour. of Laryng., Aug., '97*).

When at all possible it is better to remove adenoid growths without the use of a general anæsthetic, as there can be no doubt that anæsthesia adds an element of risk to the operation. Locally applied, cocaine is invaluable; it renders the presence of instruments tolerable and the operation quite easy, especially if the palate can be retracted with either hook or tape. But the dexterous operator generally requires no auxiliary assistance (palate-retraction or naso-pharyngeal illumination), and contents himself with sunlight directed into the throat, and perhaps of the index finger to guide the instrument into the naso-pharynx.

When a general anæsthetic is used the patient should be placed in bed or on a couch with the head on a level with the body, which position should be maintained—after the patient has been raised or turned to expel the blood from the naso-pharynx—until the immediate effects of the anæsthetic have passed off. Sometimes retching and vomiting of blood that was swallowed occur after the operation.

The after-treatment is simple. The patient should be kept in-doors for a period of a week and the nose occasionally sprayed with a warm alkaline solution. If reactionary symptoms appear, they should be met in accordance with their nature and severity. If confident that the adenoid vegetations have been thoroughly removed, the nose and pharynx, etc., should be examined for enlarged tonsils, spurs, deflection of the septum, and chronic hypertrophies of the mucous membrane. If one or more of these conditions are found to exist, the

trouble should be corrected, to avoid encouragement of recurrence of lymphoid hypertrophy.

Acute Naso-pharyngitis.

Symptoms.—In the first stage of this affection a more or less marked sense of dryness in the parts, and, perhaps, possibly some difficulty in swallowing, is experienced. In the course of a day or two a mucous discharge appears which at first is thin and gradually becomes thicker and more purulent.

The annoying symptom which early establishes itself is the dropping of secretions into the throat, causing a constant desire to hawk and expectorate. As the disease progresses the voice in not a few instances becomes altered. Hoarseness or "raspiness" is complained of. If the Eustachian tubes are implicated in the morbid process, tinnitus, impaired vocal resonance, darting pains along the Eustachian tract, etc., are also complained of.

Symptoms of acute rhinitis or pharyngitis may also appear when acute catarrhal inflammation of the naso-pharynx coincidentally exists with one or both of these diseases.

The course of the disease is variable. Sometimes the mucous secretion ceases in a few days, and the mucous membrane returns to the normal, while again, notably in debilitated persons, the malady lingers on for weeks or months, eventually assuming a subacute or chronic character.

Among the complications to be encountered is involvement of the Eustachian tube and of the middle ear. Sometimes the orifices of the tube are found red and swelled and covered with secretions; a feeling of fullness and bubbling in the ear is produced upon blowing the nose. Sero-mucous and purulent

middle-ear inflammation may follow such a condition.

Etiology.—Acute naso-pharyngitis is sometimes produced by an extension of inflammation from the nasal passages or from the pharynx. The various causes inducing acute inflammation of the mucous membrane of the nose—such as inhalation of dust, climatic changes, eruptive fevers, exhaustive diseases, etc.—also play an important etiological rôle.

Among the local causes chiefly to be mentioned is the presence of adenoid or lymphoid overgrowths. That such a condition forms a predisposing cause of the attacks cannot be questioned; this is particularly during childhood and youth, the periods when acute naso-pharyngitis is most common. Acute inflammation of the naso-pharynx then frequently gives rise to purulent rhinitis or inflammatory disturbances of the fauces.

Pathology.—The existence of such a disorder as acute idiopathic catarrhal inflammation of the naso-pharynx is not accepted by all observers. That it does can be substantiated by clinical evidence. This is especially true when the sympathetic system becomes influenced through some factor tending reflexly to dilatation and engorgement of the blood-vessels. It is due, in the majority of cases according to Sajous, to extension of neighboring disorders through contiguity of tissue.

Prognosis.—Of utmost importance is the early recognition and treatment of this affection. If the disease is neglected and allowed to run on unattended, it is destined, in the majority of cases, to resolve itself into a chronic catarrhal disorder: a persistent and troublesome malady.

Treatment.—In the early stage, when pain and dryness of the parts are present accompanied by general malaise and a febrile movement, considerable can be

accomplished toward alleviating suffering and aborting the disease by the administration of small doses of apomorphine ($\frac{1}{16}$ grain) frequently repeated. Should there be any hepatic torpidity or digestive disturbances, a mercurial, followed in four or six hours by a saline purgative, should at once be administered.

Warm alkaline lotions, applied in the form of a spray to the nasal passages or post-nasal spray, prove grateful and beneficial. A solution of cocaine (4 per cent.) applied in the same manner affords immediate comfort and aids in controlling vascular engorgement. After the disease has passed the stage of acute hyperæmia, and muco-purulent secretions appear, astringents or alteratives are indicated. Sulphate or sulphocarbolate of zinc and silver nitrate applied with a pledget of absorbent cotton, at intervals of twenty-four or forty-eight hours in solution of the strength of 2 per cent. or 4 per cent., are especially valuable. In the employment of silver solutions the larynx should always be previously cocainized to avoid the laryngeal spasm that would follow the accidental dropping of some of the solution into the cavity.

An aqueous solution of suprarenal-capsule extract (10 grains to 1 drachm of saturated solution of boric acid) topically applied, has been found to be of considerable value in reducing the acute hyperæmia and inflammation of the parts.

Solution of ichthyol, $\frac{1}{2}$ of 1 per cent., applied by the patient himself every two hours, considered as very efficient in naso-pharyngeal catarrh. P. Meyjes (Geneesk. voor het Konin. der Nederlanden, Sept. 4, '92).

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Turpentine with oil of anise makes a valuable application, especially in acute exacerbations of naso-pharyngitis. It may be diluted with lavender. This

should be applied to the naso-pharynx with the cotton tuft on a curved applicator several times weekly. It is best to use the rhinoscopic mirror in every case in which applications are made to the naso-pharyngeal region. Somers (Memphis Lancet, July, '98).

Chronic Naso-pharyngitis (Chronic Post-nasal Catarrh).

Symptoms.—The subjective symptoms are mainly due to the accumulation in the naso-pharynx of a more or less purulent secretion, which causes coughing and hawking; while the local inflammatory disorder may cause dull headache; altered voice, taste, and smell; and temporary deafness due to the interference with the function of the Eustachian tube. The patient complains of a tendency to colds in the head, sudden losses of voice, temporary pains, and raw sensations in the throat. He frequently "hawks" masses of muco-pus more or less desiccated: a feature that gives him the greatest concern. The rhinoscope shows local hyperæmia; the naso-pharynx is more or less covered with pus or dried secretions, which, when removed, often leave bleeding surfaces. The vault of the naso-pharynx with its adenoid cushion is generally puffed out and discharges quite freely. Local dryness is sometimes observed.

There is often considerable elongation of the uvula, also an infiltration and thickening of the pillars of the fauces. Laryngitis is a frequent complication, while other morbid conditions of reflex origin—such as chorea, reflex epilepsy, neuralgia, supra-orbital headache, gastric disturbances, uterine disorders, retarded development, and simple anæmia—may be induced.

When extending over a long time these cases often develop dry naso-pharyngitis. The main features of this condition, also termed "sclerotic post-nasal catarrh," are

not unlike the same condition of the nasal fossæ (atrophic rhinitis); it may be and often is complicated with ozæna. It may occur as a sequel to catarrhal inflammation and be dry from the start.

Under these conditions the oro-pharynx appears dry and lustrous; and may be covered with scales of dark-colored dried mucus. When the stage of ozæna is reached, every few days round, oval, or cup-shaped masses of dried mucus are expelled, which vary some as to color and consistence. On cleansing, the mucous membrane looks pale and atrophied.

Etiology.—Childhood seems to be the most favorable time for this disease to appear. The gouty, syphilitic, scrofulous, and tuberculous diatheses seem to predispose to it, and under these circumstances it is very apt to become chronic or sub-acute. Incessant use of tobacco, cocaineism, alcoholism, diseased nasal passages, enlarged tonsils, chronic gastric disease are all undoubted etiological factors. Suppurative diseases of the ethmoidal and sphenoidal sinuses where the pus flows into the naso-pharynx evidently are a cause of chronic naso-pharyngitis. Chronic follicular tonsillitis and its cheesy, pus-producing deposits, and decaying and neglected teeth are also causative.

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Cases of bilateral tubercular glands constitute over 70 per cent. of the cases personally observed, and, with the addition of some cases of unilateral disease, in over 80 per cent. the exciting cause of the enlargement was found in the naso-pharynx. There seems ground for the belief that of naso-pharyngeal catarrhs a number are in their nature tubercular. Nicoll (Glasgow Med. Jour., Jan., '96).

Pathology.—Chronic naso-pharyngitis may be divided pathologically into three varieties: the diffuse, hypertrophic, and

sclerotic or atrophic. The diffuse form is present early in the disease, before the infiltration of cellular deposits has taken place; it is the transition period preceding the chronic disease. In the hypertrophic form there is infiltration of the cellular elements, this stage culminating in sclerosis,—the third form,—in which atrophy and loss of function occur.

Prognosis.—The disease is controllable by appropriate treatment if it is not of too-long standing. In the latter case, however, it is practically incurable. Pharyngitis sicca is a particularly obstinate affection.

Treatment.—If any constitutional condition exists, this must first be appropriately treated. Locally, cleanliness is the first essential and should be accomplished by some non-irritating alkaline, disinfectant solution, such as Seiler's or Dobell's. After the cavity has been cleansed, topical applications should be made to the post-nasal space as the condition indicates. When dry, stimulants and alteratives such as nitrate of silver, 20 grains to the ounce, and iodine pigment are to be applied. The following preparation is useful:—

R Iodine crystals, 6 to 10 grains.

Kali iodidi, 12 to 20 grains.

Glycerin, 1 ounce.—M.

This should be followed by the application of some oily spray as albolene-and-menthol solution, and be applied about every other day. If the naso-pharyngeal vault contains adenoid granulations, these should be curetted.

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Attention drawn to the benefit which occurs from removal of septal spurs, ridges, and exostoses in chronic naso-pharyngitis. They are extremely common in this connection and should be removed with the saw. C. H. Knight (Laryngoscope, Apr., '97).

Tumors of the Naso-pharynx.

Neoplasms of the naso-pharynx may be divided into four varieties, namely: *myxomata*, *fibromata*, *sarcomata*, and *carcinomata*. The most common of these are the fibromata, the malignant variety rarely appearing.

MYXOMATA are frequently found in the naso-pharynx, while their point of origin is located in the nasal passages. Thorner reported a case, however, in which a mucous polypus of unusual size had its origin in the naso-pharynx in front of the orifice of the Eustachian tube.

FIBROMATA are rare, occurring chiefly between the ages of ten and twenty-five. In no respect do they differ from similar growths in the nose. They spring from the periosteum or connective tissue of the vault, their point of attachment being the body of the sphenoid, the basilar process of the occipital bone, or the anterior surface of the upper cervical vertebrae.

Projections not infrequently extend into the nasal passages and occasionally appear at the anterior nares. They grow very rapidly, embracing and destroying by pressure the walls of the nasal passages and associated sinuses and more or less obliterating them. The so-called "frog-face" is very characteristic of this disease. These tumors are dense and resistant and are very prone to bleed under manipulation. The rhinoscope reveals a round, smooth, pinkish mass. The usual symptoms of post-nasal obstruction are present. Some cases are characterized by severe bulging of the soft palate, while at the same time the tumor is seen to protrude below the palatine arch. After the growth has attained considerable size, headache becomes a marked symptom. The patient also appears dull and stupid. The disease almost always occurs in males.

Case of naso-pharyngeal fibroma in a girl of 15. The case is interesting on account of the rarity of these growths in women. Tellier (Lyon Méd., Aug. 11, '89).

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Fibroma of the naso-pharynx is almost exclusively confined to males from 15 to 25 years of age. Nélaton is quoted as not having "known of a single authentic example of true naso-pharyngeal fibroma in a female of any age, or in a male over thirty-five." Of 58 cases collected by Lincoln, of New York, all occurred in males under twenty-five. Woodson (Laryngoscope, Aug., '98).

After the age of 25 years fibromata seldom develop; when present after that age they tend to disappear spontaneously. Then, too, exceptional cases have been reported in which the tumor disappeared through a process of sloughing. Adhesions occasionally occur. Fibromata are not malignant, but sometimes become dangerous in consequence of encroachment upon neighboring structures. When the tumor extends toward the laryngeal cavity interference with deglutition takes place. The cranial cavity may also become involved or invaded by the tumor and create pressure on special nerves and severe pain. Deafness is not an unusual symptom and is produced by occlusion of the Eustachian orifice. Prognosis is favorable in most cases when complete removal is accomplished.

FIBROMYXOMATA are similar to fibromata, but do not tend to destroy the neighboring bones or cavities. The prognosis is always favorable.

SARCOMATA of the naso-pharynx are of exceedingly rare occurrence. To distinguish between a benign and malignant growth of this region is sometimes difficult. The round-cell variety is that usually found in the naso-pharyngeal cavity. Age has no particular significance,

as the disease has been observed in both young and old alike.

Treatment.—Evulsion with forceps is resorted to by some operators, a curved uterine écraseur by others. The galvano-cautery-snare and puncture have their advocates.

I employ a powerful post-nasal snare designed by myself especially for this sort of surgical work. The aim should always be to take away as large a mass as is practicable with as little hæmorrhage as possible. The post-nasal snare fulfills this mission in several respects. To obviate great loss of blood, tamponing the upper pharynx and posterior nares is resorted to. To the tampons are attached oral and nasal ends of tape for purposes of fixation just before the wire is expected to sever the tumor from its base, after which procedure the snare is withdrawn. In the course of twelve or twenty-four hours the tampons can be removed without any loss of blood whatsoever.

Electrolysis when judiciously and properly applied holds a valuable and prominent position in the treatment of new growths of the naso-pharynx.

When the tumor is unduly vascular and cannot be manipulated without loss of blood, prior treatment with the electrolytic needle accomplishes considerable toward the limitation of hæmorrhage.

After the use of the post-nasal snare, the remaining base should also be treated by means of electrolysis; resolution is thus favored and the liability to recurrence becomes less marked. The so-called radical operation, for example, the excision of the superior maxillary bone with a view of obtaining access to the naso-pharynx, seems unnecessary in any case. The radical method does not seem to accomplish any more than the operative measures above stated, and, at the same time immediately jeopardizes the life

of the patient and certainly produces permanent disfigurement.

The accompanying catarrhal states will improve under the use of warm alkaline lotions. The douche or syringe does not recommend itself on account of the danger of forcing fluid into the middle ear, from which accident a more or less serious tympanic trouble may arise.

JACOB E. SCHADLE,
St. Paul.

NECROSIS. See JAWS and OSSEOUS SYSTEM.

NEPHRITIS. See BRIGHT'S DISEASE.

NEPHROLITHIASIS AND NEPHRITIC COLIC. See URINARY SYSTEM.

NERVES, PERIPHERAL, DISEASES OF.—The general conditions of disease to which any or all of the peripheral nerves are liable are: 1. Circulatory disorders. 2. Inflammation. 3. Degeneration. 4. Functional disorders. 5. Neoplasms.

Circulatory Disorders.

The circulatory disorders of any importance are: (a) Anæmia. (b) Hyperæmia.

(a) **ANÆMIA.**—This is a frequent accompaniment of general anæmic states, and is also seen as a result of obstruction of the blood-vessels of the nerves from atheroma or other cause, and also occurs with the vasomotor neuroses. The condition is of chiefly theoretical interest, since a positive diagnosis is always difficult and frequently impossible, the symptoms being various and oft-times vague and lacking in characteristic features. Anæmia is doubtless in some instances a cause of neuritic pains and neuralgias, and some of the pains and paræsthesias accompanying the ather-

omatous arterial changes of old age are doubtless due to this condition. Almost any of the ill-defined peripheral motor and sensory abnormalities of the nerves may at times be presumptively traced to anæmia.

Treatment.—The successful treatment of the condition is based upon a recognition of its primary cause, and is directed toward the removal of this cause, together with the use of general tonics and hygienic measures calculated to improve nutrition and circulatory activity. In the aged and feeble, with diseased arteries, all remedial measures may prove disappointing.

(b) **HYPERÆMIA.**—This condition also is only recognizable with difficulty, although the symptoms are somewhat more definite and characteristic than are those of anæmia of the nerves. The most commonly observed symptoms are muscular weakness, tenderness or pressure along the course of the nerve; pain, darting, stabbing, or neuralgic in character; together with sensory perversions. A true neuralgia may have as its basis hyperæmia of the nerves. The symptoms are, it will be seen, much the same as those of an early stage of neuritis.

Etiology.—The causes of hyperæmia of the nerves are: adjacent inflammations, mechanical injuries, exposure to cold; bacterial, alkaloidal, metallic, and other poisons; rheumatism, gout, and other diathetic diseases; in short, the causes which, when intensified or prolonged, cause neuritis.

Treatment.—The best results in treatment are obtained from cold applications, leeches, cupping, and counter-irritation. Massage and hydrotherapeutic measures are beneficial in chronic cases. Of internal remedies, potassium iodide and preparations containing iron give the best results.

Neuritis.

Inflammation of the nerves is, in most instances, associated with more or less degenerative change in the nerve-fibrils of the affected nerves. When the morbid process involves the nerve-sheaths and connective-tissue structures in particular we have an "interstitial neuritis," and the changes are chiefly inflammatory in nature. When the disease locates itself in the nerve-fibrils it gives rise to "parenchymatous neuritis": a condition partaking more of the character of a degeneration than of a true inflammation. In practice these two morbid states are usually combined—"diffuse neuritis"; so that, as indicated above, the so-called "neuritis" embodies both inflammatory and degenerative changes. There are many named varieties of neuritis, based upon etiological differences, intensity of the disease, its distribution, etc., and much confusion resulting therefrom. The practically important varieties are the following:—

(a) Traumatic neuritis, resulting from direct mechanical injury to the nerve, as from blows, wounds, pressure, etc.

(b) Neuritis from exposure to cold, sometimes improperly called "rheumatic."

(c) Neuritis caused by extension of disease from adjacent parts (tuberculosis, syphilis, bone disease, etc.).

(d) Forms of neuritis resulting from presence of bacterial poisons in the blood, exemplified in the neuritis accompanying or following typhoid fever, malaria, variola, syphilis, diphtheria, etc.

(e) Neuritis resulting from action of poisons introduced from without, such as alcohol, lead, arsenic, mercurials, opium, etc.

(f) The endemic or epidemic form of neuritis, seen in tropical islands and sea-

coast countries, the well-known "beriberi" (see *BERIBERI*, volume i).

(g) The neuritis accompanying certain skin eruptions or other trophic changes (*HERPES ZOSTER*, see volume iii).

Whatever the pathological nature or etiological origin of neuritis, if a single nerve or small group of adjacent nerve-trunks be affected it is called a "simple neuritis." If a number of nerves in different portions of the body be simultaneously invaded we have a "multiple neuritis." The neuritis from mechanical injury, exposure to cold, and other local causes is usually "simple"; the general infections, drug poisonings, and other toxæmias give rise most often to "multiple" neuritis. Of course, there are exceptions to these rules, since a general toxæmia may produce only localized effects—a simple neuritis—and a mechanical injury may involve a large nerve-trunk or several large nerves and give the symptoms of a multiple neuritis, as has been seen in cases of pressure upon lumbar and sacral nerves of a large aneurism. A simple neuritis is usually "interstitial"; a multiple neuritis is apt to be chiefly "parenchymatous."

Simple Neuritis.—A simple or localized neuritis arises from exposure to cold, involving in such cases nerve-trunks which lie near the surface of the body the most frequently observed clinical form being "Bell's paralysis," or "facial paralysis"; from traumatism,—blows or wounds; pressure, as from morbid growths; aneurisms, sleeping upon arms, crutches used long or injudiciously ("crutch paralysis"); and from tubercular or other disease which involves the nerves by extension from adjacent affected parts.

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In study of neuritis from bicycle-riding it was found that if the handle be so constructed as to be grasped at a right angle with the full hand, no injury can result; but if the handle must be grasped at an acute angle, pressure is exerted near the wrist, where the nerves are comparatively superficial, and considerable damage may be done. Destot (Prov. Méd., June 20, '96).

Neuritis caused by surgical operations is usually due to long-continued pressure during anæsthesia, either through force for maintaining the patient in position, by the dragging of the limbs of the table, or by the continued elevation of the arm over the head. To prevent this, the patient's arms should not be allowed to hang down, and care should be taken that during operation the weight of the body is as evenly distributed as possible. Keeping the body in any constrained position should be avoided when not absolutely necessary, and the use of any mechanical contrivance for maintaining a desired position should be with due care to prevent nerves from being stretched or pressed upon. H. T. Pershing (Med. News, Sept. 11, '97).

Number of curious cases of localized neuritis noted following slight injuries, such as too vigorous squeezing of the hands, injury by blow or pressure on the fingers, burning the skin with nitric acid, etc. Occasionally these cases are obstinate, and result in more or less permanent disability. Webber (Boston Med. and Surg. Jour., Nov. 5, '98).

Symptoms.—The symptoms of simple neuritis vary with the cause, nature, and location of the disease, but the true neural symptoms are essentially the same in all, consisting in perversion, exaltation, or, it may be, entire abolition of function of the nerves involved. There is usually pain, of a stabbing, darting character, felt in the parts to which the nerve is distributed, with some pain and tenderness along the course of the nerve. This pain is partly due to pressure or irritation of the *nervi nervorum*, and may

be very intense and distressing or may, as is often the case in mild forms of neuritis, cause little or no inconvenience. There is occasionally œdematous swelling and redness of the skin over the point of greatest inflammatory activity, and trophic cutaneous affections, sweating, and swelling of, and effusions into, joints sometimes appear. Tactile sensation is impaired in the affected area, and numbness and formication are frequent. Weakness in the muscles supplied by the affected nerves is the rule, reaching in the severer cases a complete paralysis. Muscular twitchings and spasmodic contractions are sometimes noted. In the severe and long-continued cases there is apt to be great atrophy of the affected muscles, which may be followed by contractures of fingers or toes or other parts involved. The nutrition of the hair and nails is often defective, leading to falling out or grayness of hair, deformities or dropping away of nails, etc.

The electrical reactions in simple neuritis vary with the intensity of the disease, being in the milder cases nearly or quite normal, but showing in all of the severe forms a partial or complete reaction of degeneration.

The duration of a simple neuritis depends chiefly upon the severity or curability of the initial lesion. The symptoms may pass off in a few days, or may persist for months. Recovery is the rule, and is always obtained, provided the cause is one which can be removed. In very unfavorable cases some permanent contracture or paralysis may result.

Pathology.—In simple neuritis the changes are chiefly localized in a limited portion of the nerve-trunk, only the degenerative changes in nerve-fibres, where such a parenchymatous lesion is present, extending along the entire distal portion of the nerve. At the point of

injury the nerve-trunk is red, swelled, and infiltrated with lymphoid elements, and may be surrounded by a gelatinous exudate. The changes involve especially the perineural and interstitial connective-tissue frame-work. In mild cases the nerve-fibrils themselves are slightly, if at all, involved; in severer cases, or where the fibrils have undergone compression from swelling of connective-tissue structures, the nerve-fibrils show the alterations of parenchymatous neuritis; their myelinic sheaths are fragmented, the nuclei of the sheath of Schwann and of the internodal cells are increased in number, or may seem swelled; in still more severe cases the axis-cylinders show marked degenerative alterations, become varicose, swell, disintegrate, and even entirely disappear, the appearances being then nearly identical with those of a true Wallerian degeneration. These changes in the axis-cylinders necessarily involve all of the nerve-fibre lying below the seat of injury, but are usually arrested at the first node of Ranvier above, although in some cases they may extend upward, even quite to the cord. The blood-vessels at the seat of an injury are often distended, and minute hæmorrhages into the nerve are of not infrequent occurrence. The disease may go on to complete destruction of the nerve-elements, the degenerated fibres being replaced by connective tissue and by fat-cells: a condition, when the fat-deposits are abundant, called by Leyden "lipomatous neuritis." Regeneration begins after a short time, and, if the original nerve-injury be removed, the nerve may, even in very severe cases, ultimately regain its former healthy state.

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Many cases of mild neuritis pass unrecognized, being looked upon as rheumatism.

Peripheral neuritis may be isolated, confined to one or a few nerves; it may be multiple, symmetrical in its distributions, affecting the nerves of all the extremities. In isolated neuritis the disease begins in the nerve-sheath, constituting a "perineuritis," the inflammation extending to the nerve-fibres afterward. In the multiple forms the nerve-fibres themselves are the seat of the primary change, the sheath becoming affected later. These forms of multiple "parenchymatous" neuritis are always due to some virus in the blood, an organic or inorganic chemical compound usually. Isolated neuritis is due to some cause acting locally, and if several nerves are affected their distribution is irregular, not symmetrical. In these cases there is always a constitutional cause at work as well, predisposing to the disease.

Alcoholic peripheral neuritis is the form most often met with.

The recurrence of neuritis as the result of medicinal use of arsenic is not very rare. Of predisposing causes in isolated peripheral neuritis, gouty and rheumatic conditions are among the most frequent. Lithæmia should be added to these. Lithæmia is probably the most frequent predisposing condition leading to the development of inflammation of the nerves after injury to them. Alexander McPhedran (*Med. News*, Oct. 31, '96).

Treatment.—As a necessary preliminary to any treatment, the cause of the disease must be removed. After this, rest of the affected part, absolute and continued for several days, should be insisted upon. The use of splints to limbs is sometimes advisable. Heat, especially moist heat,—as from steam, poultices, or fomentations,—gives great relief from the pain. Counter-irritation by mustard plasters or other means is sometimes equally efficacious. In many instances the galvanic current used in strength sufficient to redden the skin gives immediate and wonderful relief. Occasionally in early stages ice locally ap-

plied will give more relief than anything else. Of internal remedies, salol, the salicylates, and the whole series of coal-tar derivatives—in particular, antipyrine, phenacetin, and acetanilid—may be used in the confident expectation of obtaining measurable relief from the pain. When other remedies fail the local hypodermic use of morphine is, where pain is very intense, justifiable. The early use of mercurials—calomel or blue mass—is often attended by good results. In any case the bowels should be kept open by salines or a simple purgative pill. Attention should be paid to the general health. In most instances tonics and alteratives will be found beneficial.

After subsidence of the acute stage and after all tenderness, redness in skin, pain in parts, etc., have disappeared, systematic massage and the use of faradic stimulation to the muscles will hasten restoration of function in muscles and cutaneous surface.

Literature of '96-'97-'98.

In ten cases of traumatic neuritis surprising results obtained by following method:—

Exact extent of painful area is defined; then patient, either sitting or lying, is supported by assistants, and the operator compresses the affected part between his own finger and thumb with all his strength. This is done successively over the whole extent of the hyperæsthetic area, over and around the cicatrix, beginning at the most painful point. If after first application, which lasts only a few seconds, any hyperæsthesia remains, the procedure is repeated after a few minutes' rest, and this may even be done a second or third time after a few days' interval; in many cases a single sitting is enough. The pressed limb is then wrapped up for eight or ten days in a wool dressing. Delorme (*Jour. de Méd.*, June 25, '96).

Multiple Neuritis.

Synonyms.—Polyneuritis; disseminated neuritis; peripheral neuritis.

Definition.—This disease is a parenchymatous neuritis affecting many peripheral nerves at or about the same time.

Varieties.—Numerous varieties and forms of multiple neuritis are recognized, and of these the more important have received distinguishing names, as is mentioned below. The varieties, as in the case of simple neuritis, arise from differences in nature, causation, severity, and location of the morbid process. The causes of multiple neuritis are: bacterial infection, toxic substances in the blood, anæmia, and dyscrasic states; in short, any state of toxæmia or malnutrition.

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The alteration of peripheral nerve-apparatus, with the very marked changes of the cord and bulb as well as of parts situated higher, indicates that the affection called multiple neuritis is one which involves not only the peripheral nerves, but the whole nervous system—nerve-cells as well as nerve-fibres. Soukanoff (*Archives de Neurol.*, Mar., '96).

During pregnancy, and also after parturition, patients sometimes suffer from peripheral neuritis, which cannot be traced to any of the usual causes. This "puerperal neuritis" has been distinguished from neurites caused by alcohol, lead, diphtheria, or septicæmia, and was described by Möbius as a multiple neuritis due to the circulation in the blood of a poison produced by the patient herself during gestation. It is quite distinct from "obstetrical neuritis," which is due to injury of nerve-trunks in the pelvis by instruments or by the child's head during labor, or to pelvic inflammatory conditions following labor. The symptoms and course of the disease are extremely like those of alcoholic neuritis, so much so that the diagnosis can only be made by excluding alcohol and other possible causes. Turney (*St. Thomas's Hosp. Reports*, vol. xxv, '98).

Symptoms and Diagnosis.—The disease may come on suddenly and reach its greatest intensity within a few days (acute bacterial infections), or may show a slow and insidious onset (alcoholic and cachectic forms). The characteristic and ever-present features of the clinical picture are the abnormalities of nerve-reaction: *i.e.*, alterations in sensory, motor, reflex and trophic function of the nerves involved. The extraneural symptoms vary with the cause and nature of the initial morbid impulse. In the typical acute “idiopathic” cases and in cases accompanying acute infectious diseases the attack comes on with fever and the other usual features of the onset of an acute infectious malady. A chill may be the first indication. Headache and aching in the back and limbs are frequent, as are also loss of appetite, furred tongue, constipation and other evidences of gastrointestinal disturbance. The real nature of the case may be obscure for the first few days, but within this time the true neuritic symptoms make their appearance, and all doubt is quickly removed. Pain along the course of the nerves in legs or arms, or both, is noted, with tenderness in the muscles as well as in the nerve-trunk. Perversions of sensation now appear, in the form of tingling, formication, diminution in tactile sense, or hyperæsthesia or in rare cases anæsthesia. In addition to the above-mentioned tenderness on pressure the muscles in the parts affected become relaxed and flabby; there is weakness or even in severe cases complete paralysis. This muscular weakness begins most frequently in the legs, extending upward by degrees, reaching the arms, when these become affected, some time after the symptoms in the legs are well established. In many cases typical “wrist-drop” and “foot-drop” are shown. The paralysis

may reach the muscles of phonation, deglutition, and respiration, resulting in some degree of impairment of these functions. In severe cases, especially in those of rapid onset, the pneumogastric nerve may be involved, resulting in marked tachycardia. Trophic disorders are also of frequent occurrence, such as œdema, glossy skin, and herpetic eruptions in the area affected. The tendon-reflexes are usually diminished or abolished. In all save the milder cases there are changes in the electrical reactions similar to those of simple neuritis. The muscles lose their faradic excitability and with the galvanic current show a slow, worm-like contraction, with anodal closing contraction greater than the reaction to cathodal closure.

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In multiple neuritis of septic origin the seat of the disease appears to be very variable; only the forearms or the legs may be involved, or the whole of the limbs, individually or together. Sometimes the gluteal muscles may be affected, also the external ocular muscles, and the parts supplied by the vagus. Psychical disturbance is very often present in addition. Hugo Kraus (Wiener klin. Woch., No. 40, '97).

The intensity, rapidity of onset, course, and duration of multiple neuritis vary considerably in different cases. In some the pain is scarcely noticeable, the motor symptoms predominating. In mild cases there may be only slight stiffness or weakness of the muscles, passing off in a few days. In other cases the pains are violent and excruciating, and the paralysis of the muscles is total and long continued, months elapsing before the patient regains use of the paralyzed limbs. Deaths are not infrequent, occurring during the acute stage from failure of respiration or heart-action, and

in chronic stage from exhaustion or intercurrent complications, as pneumonia, pleurisy, or tuberculosis.

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With few exceptions the prognosis of peripheral neuritis is good; recovery will be long delayed in severe cases, and in a few acute cases a fatal termination occurs within a few days or weeks.

Bad cases grow worse for weeks or months and then remain stationary for a time. Complete recovery requires several months. Alexander McPhedran (*Med. News*, Oct. 31, '96).

In cases with involvement of the spinal cord the prognosis is unfavorable.

In all except the mildest cases of neuritis recovery is slow, and is preceded by a stationary period, which lasts one or two months. Some power may be regained after two or three months, but the average duration of the weakness is six or seven months, and it may be a year before all the muscles recover. C. L. Allen (*Med. Rec.*, Apr. 24, '97).

Out of 49 cases of peripheral neuritis, in 14 cases there was either no recovery or but partial cure. In 22 cases recovery was complete, while in 13 no mention was made of the termination. Reynolds (*Brit. Med. Jour.*, No. 1920, '97).

In cases of multiple neuritis from other causes than acute bacterial infection there are few constitutional symptoms: a more gradual onset and a greater chronicity. The diagnosis, also, is easier, since the neural abnormalities are not masked to such an extent by the symptoms of acute disease.

It should be remembered that the characteristic symptoms of multiple neuritis and those upon which a diagnosis must rest are the motor, sensory, reflex, and trophic nerve-disorders; the gastrointestinal, cardiac, respiratory, and other occasional features may or may not be present; and to the symptoms of any multiple neuritis may be added the com-

plicating clinical picture of some acute disease to which the neuritis is possibly due. If the nerve-reactions are tested for, there will be little danger of error in diagnosis. In the acute cases of sudden onset in which tachycardia and respiratory distress, with general œdema, pallor of surface, loud heart-murmurs, etc., are present the peripheral nerve-disorders are masked and the case is liable to be regarded as one of acute "heart-failure" or "Bright's disease" unless careful tests are made for neural symptoms. Chronic cases resemble in many particulars locomotor ataxia; the characteristic gait, the lightning pains, girdle sensation, and absence of muscular weakness in ataxia ought, however, to render a diagnosis easy.

Although many cases of alcoholic neuritis have a resemblance to tabes, yet in neuritis muscular weakness and physical disturbances are among early symptoms, while in tabes they usually develop late in the disease. Bernhardt (*Berl. klin. Woch.*, July 14, 21, '90).

The onset and course of acute anterior poliomyelitis is not unlike that of acute peripheral neuritis. The fact that the former occurs in children, the latter in adults, and the absence in poliomyelitis of the marked sensory symptoms of neuritis are sufficient distinguishing points.

The disease is of frequent occurrence, coming often within the notice of both the neurologist and general practitioner of medicine. The alcoholic, syphilitic, post-febrile, and toxic forms are common in all climates. In the southern United States malarial and idiopathic forms are often seen, and two instances of the occurrence of the epidemic variety (beriberi) have been reported, one at Tuscaloosa, Ala., and one at Little Rock, Arkansas, both among insane patients, both epidemics during 1895-96.

Pathology.—We have to deal in mul-

multiple neuritis with a general toxæmia or nutrition deficiency in the blood, causing degenerative changes in the nerve-fibres of the peripheral nerves, associated in some instances with such inflammatory changes as were described under simple neuritis. The peripheral ends of the nerve-threads, being farthest removed from the trophic centre (the cell-body), show the first and most pronounced changes. In severe cases the entire cell may become involved or be destroyed. The anatomico-pathological changes are similar to those described under simple neuritis.

Treatment.—The treatment of multiple neuritis should first be directed toward the removal of the cause and the relief of the pain and acute symptoms; after this, measures which hasten regeneration of nerve- and muscle-fibres are indicated. In idiopathic cases a full dose of calomel, followed by a saline, is beneficial. Intestinal antiseptics also aid. The pains are controlled by hot applications, dry or moist, and by the coal-tar derivatives and opium. After subsidence of the acute stage, massage and rubbings of affected parts, with faradic electricity, give the best results in hastening regeneration. Systematic exercise should be advised as soon as the condition of the muscles permits of it. Tonic doses of strychnine and arsenic seem to hasten recovery. In the distressing case in which tachycardia is a prominent symptom all heart-stimulants are apt to prove of no avail, the best results being obtained from cold applications to the chest. In the paralytic cases where, after long-continued helplessness, contractures and permanent deformities are threatened, passive movements and, if need be, fixation of limbs by means of properly-adapted splints may be required.

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If the symptoms of peripheral neuritis in pregnancy are very severe, the labor should be terminated, as after delivery recovery sets in. G. Elder (*Lancet*, July 25, '96).

In treatment of multiple neuritis the cause should first be removed. For the neuritis this is no specific remedy. Anodynes may be required to relieve the pain. Rest and protection of the parts from injury are of importance. Some satisfactory results from use of strychnine, especially by subcutaneous injection: $\frac{1}{30}$ to $\frac{1}{20}$ grain, twice daily. As soon as the tenderness has abated, massage and baths will prove useful. In the later stages the rousing of the patient's latent energies and encouraging him to make voluntary use of the muscles, as far as possible, will do more to accomplish the objects in view than any other plan of treatment. A. McPhedran (*Med. News*, Oct. 31, '96).

Case of alcoholic neuritis in a man which was cured by administration of 0.1 grain of strychnine four times daily. E. R. Houghton (*Med. Rec.*, Jan. 14, '99).

The more important varieties of multiple neuritis are the following:—

SYPHILITIC NEURITIS.—This occurs as a result of syphilitic infection. The onset is afebrile and insidious, acute, active symptoms being wanting. The course is chronic. Some cases resemble tabes ("syphilitic pseudotabes").

Treatment.—The cure is effected through removal of the syphilitic poison by iodides, hot baths, massage, and electricity.

ALCOHOLIC NEURITIS.—Caused by chronic alcohol poisoning. Gradual onset, without fever or disturbance of general bodily functions. Chronic course. Cure usual, through removal of cause. (*Vide* article on ALCOHOLIC NEURITIS in volume i.)

Literature of '96-'97-'98-'99.

Two interesting cases of trophic degeneration of the vessels following peripheral neuritis. First case was a man with alcoholic history, who developed symptoms of a general peripheral neuritis; showed gradual enfeeblement of the circulation in the extremities, followed by partial gangrene of the toes. Vessels of the extremity were to be felt as thickened cords, and microscopical examination showed an obliterating endarteritis. A neuritis was also shown to exist. In the second case there was a neuritis of one leg and arm, with an ulcer on the sole of the foot. Both by the course of these cases, and also by personal observations of cases with old vascular lesions, it is shown that the nervous lesion is the primary one. Lapinsky (*Arch. de Méd. Exper.*, Jan., '99).

ARSENICAL NEURITIS, SATURNINE NEURITIS, and other related forms are due to injudicious or excessive use of arsenic, lead, or other similar drug.

These are readily curable through removal of the cause.

POST-FEBRILE NEURITIS, following typhoid or other fever, **DIPHTHERITIC NEURITIS, SCARLATINAL NEURITIS,** etc., are caused by the poisons of these infectious diseases. The neural symptoms are complicated by the features of the associated germ disease. Disappearance of the acute disease is followed by recovery.

MALARIAL NEURITIS occurs in malarial localities, not always accompanying or following malaria, but occurring in some persons in a community while others suffer from malaria. Onset, course, clinical picture, and terminations as in idiopathic forms. It resembles beriberi in some particulars.

Treatment.—Quinine and, where possible, change of residence are indicated.

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In a form of multiple neuritis in the West Indies the patient presents himself

complaining of numbness and cramps in hands and feet, dimness of vision, and tightness round the waist. There is also a burning sensation in the soles of the feet and in the palms of the hands, worse at night usually than in the day, and there is, as a rule, slight excoriation with fine desquamation at the edges of the eyelids and at the margins of the lips and nostrils. The main nerve-trunks in the limbs are tender to pressure, and this is particularly true of the ulnar nerve, and along the distribution of the terminal filaments are fine herpetic vesicles. The muscles of the limbs waste and the trunk-muscles may become involved and lead to respiratory difficulty. The pupillary reaction is not impaired, although vision is much reduced.

The mental condition is unimpaired except in the extreme cases in which delusions may be present. The reflexes do not differ in their condition from the condition of these phenomena found in other kinds of neuritis. Malaria is the most probable toxic agent, although the poison may be the result of some micro-organism or other agency at present unknown. Strachan (*Practitioner*, Nov., '97).

ENDEMIC NEURITIS, OR BERIBERI, caused probably by specific bacterial infection, is rarely seen save in the tropics, near the sea-coast. (See **BERIBERI** in volume i.)

TUBERCULAR NEURITIS, RHEUMATIC NEURITIS, SEPTICÆMIC NEURITIS, DIABETIC NEURITIS, and many other forms are spoken of by writers. Their nature is sufficiently indicated by the name.

Functional Disorders.

Varieties.—The functional disorders of the peripheral nerves may be classed as motor, sensory, and mixed forms.

The motor functional neuroses of peripheral origin are:—

(a) "Recumbent palsy," "night-palsy," or "waking numbness," characterized by temporary paralysis of one or more ex-

tremities, is noticed after lying still for a time or upon awakening in the morning. The symptoms are much the same as those seen when a nerve is compressed, as when a limb "goes to sleep"; but are not caused by pressure, and should not be confounded with the pressure paralyses. It is a rare condition, occurs in neurotic subjects, and its causation and pathology are unknown.

(b) Spasm and tremor, occurring from overuse of muscles and frequently associated with some form of "occupation neurosis."

The peripheral sensory neuroses are:—

(a) Neuralgia, elsewhere described.

(b) Paræsthetic neuroses, an affection closely akin to and sometimes associated with the waking numbness above mentioned. It is a condition of little practical importance.

The mixed peripheral functional neuroses are:—

(a) Erythromelalgia, characterized by neuralgic pain and congestion in the feet occurring after severe exertion or as a sequel of wasting disease. Some form of neuritis may be associated with it.

(b) Raynaud's disease, a symmetrically occurring affection of fingers or toes, marked by angiospasm, coldness, pain, mottling, swelling, and eventually gangrene. It is a rare disease, is usually associated with anæmia or some form of toxæmia, and may be complicated by neuritis. It has by some been regarded as a neuritis, but the weight of evidence is against this view, and in the present state of our knowledge the disease may properly be included among the functional neuroses.

Neoplasms.

Tumors growing in or upon the nerve-trunks are either true neuromata—*i.e.*, tumors composed of medullated nerve-fibres or other nerve-tissue—or are false

neuromata,—*i.e.*, composed of other than nerve-tissue. The "false" neuromata are usually of secondary origin; that is, extend to the nerve from adjacent structures, the most common kinds being fibroma, sarcoma, myxoma, and the syphilitic and tubercular growths. They need not be considered here, attention being directed only to the true nerve-tumors.

NEUROMA occurs singly or in numbers reaching into the thousands. When "multiple" they are usually small, and form shot-like, but quite painful, nodules under the skin. When few in number they are apt to be larger in size, being occasionally an inch or more in diameter. The causes of neuroma are, in the multiple form, hereditary predisposition, and, in the simple form, injuries to the nerve-trunk from blows, surgical operations, etc. The knob-like masses which develop upon the ends of the nerves of the stump after amputation offer a good example of this form of neuroma.

The symptoms of neuroma, beyond the presence of the tumor, are often *nil*. In some instances, however, there is pain, paræsthesia, or paralysis in the affected nerve-area. Occasionally the pain is intense, distressing, and neuralgic in character, as is seen in post-amputation neuromata.

Literature of '96-'97-'98.

In neurofibromatosis the tumors are both cutaneous and connected with nerves. They are of variable consistency and resemble mollusca. Usually the face is spared, also the palms of the hands, soles of the feet, and the genitals. Often they are distributed along a nerve-trunk like a string of beads. Pigmentation is frequently in small spots, but large colored areas may be seen. The patients often have loss of memory and show some difficulty in comprehension. Slowness of movement, tremors, and epi-

leptiform seizures are noted among the motor disorders; and vague anæsthesia and paræsthesia, with painful cramps, among the sensory disorders.

The disease is sometimes congenital, but may appear in adult life or advanced age. Feindel (*Jour. de Méd.*, Mar. 10, '97).

Treatment.—No treatment is called for unless there is pain or other interference with nerve-function, when surgical measures, usually a total excision, are called for and give relief.

When examined microscopically true neuromata are found to consist of nerve-fibres, medullated or non-medullated, with occasionally a few ganglion-cells interspersed, these nerve-elements being mixed with some fibrous tissue. When the fibrous tissue is abundant the growth is spoken of as "fibroneuroma."

Diseases of Special Nerves.

The several conditions of general disease above described may, when involving special nerves, give rise to well-defined clinical symptom-groups meriting brief description.

Diseases of the nerves of *special sense*—the olfactory, optic, auditory, etc.—are dealt with by specialists and are, to a large extent, devoid of general interest. The affections of the optic nerve, of which neuritis is the most important, are of value in the diagnosis of intracranial lesions.

Disease of the 3d, 4th, and 6th pairs of cranial nerves leads to abnormalities of ocular movement, whose consideration falls within the domain of the eye specialist, although the lesions are often of value in diagnosis of brain diseases.

Up to the present date there have been twenty-seven cases of recurrent paralysis of the third pair. The affection usually begins with violent pains, localized in one side of the cranium, nausea and vomiting, and contractions. The paralysis then becomes established;

ptosis, external strabismus, mydriasis, paralysis of accommodation, and crossed diplopia develop, with very intense, persistent, unilateral pain, with frequent irradiation toward the base of the head and upper portion of the neck, being greatest in the supra-orbital region. P. Darquier (*Jour. de Méd. et de Chir. Prat.*, July 25, '94).

The most important disorders of the fifth cranial nerve are neuralgia and headache, elsewhere considered. (See NEURALGIA AND MIGRAINE.)

The seventh cranial nerve may be affected by spasm or convulsive tics, or by the not uncommon and clinically important "Bell's palsy," or facial paralysis.

Facial Paralysis.

This is a motor paralysis affecting the muscles of usually one side of the face.

Symptoms.—The onset of a facial paralysis is usually sudden, or of rapid development, and is indicated by loss of power in the muscles of one lateral half of the face, with loss of emotional as well as of voluntary movements. The affected side is expressionless and smooth, the lower eyelid droops, and the eye cannot be entirely closed. The tears accumulate and run down the face. The lips are relaxed and powerless, and ability to drink, chew, articulate, etc., is impaired. The mouth is drawn toward the affected side, this and other evidences of paralysis being exaggerated when the patient laughs or smiles. The affected side may show some congestion or circulatory defect, and occasionally an herpetic eruption appears. The soft palate and tongue are not involved, although, on account of the displacement of the mouth, the tongue seems to deviate from the median line. The sense of taste in the anterior part of the tongue is lost in a small proportion of cases. There are few or no sensory abnormalities.

Literature of '96-'97-'98.

Case observed in which the unilateral facial paralysis was noticed soon after birth. In the reported cases of congenital facial paralysis, either isolated or associated with ocular palsies, the muscles of the lips and chin were less affected than the other muscles innervated by the seventh nerve. M. Bernhardt (*Neurol. Centralb.*, No. 7, '97).

The electrical reactions are the same as are seen in other forms of peripheral neuritis, their exact character depending upon the severity of the case, and for this reason possessing an especial value in prognosis. Thus, if the electrical reactions are nearly normal the case is a mild one, and recovery will most likely take place within a few weeks. If the excitability of the nerve to galvanic and faradic currents is lessened and that of the muscles to galvanic current increased and formula altered ($\text{An.Cl.C.} > \text{K.Cl.C.}$: contraction sluggish) the case is still favorable, recovery being probable within six to eight weeks. When complete reaction of degeneration is present,—that is, when faradic and galvanic excitability of nerve is lost, faradic excitability of muscle lost, galvanic excitability of muscle increased, and formula and nature of contraction altered as above,—the case is serious and will not recover for many months.

The usual outcome of a peripheral facial paralysis is complete recovery. In the few cases which terminate unfavorably the paralysis and resulting facial asymmetry may be permanent. There is atrophy of facial muscles in all severe cases, and some degree of atrophy as well as some contracture may, in the more serious cases, persist.

Diagnosis.—The diagnosis of a facial palsy is simple, inspection being all that is required in the majority of cases. The only question is whether the lesion is

central or peripheral. The peripheral cases show changes in electrical reaction, impairment of emotional movements, loss of reflex movements, and persistent paralysis of eyelid, these conditions being reversed in central paralysis. A central lesion also is usually associated with some other symptoms of intracranial disease, often a hemiplegia. The seat of the lesion can often be accurately located. If the facial nerve alone is involved and the sense of taste is unimpaired, the lesion is in the trunk of the nerve, outside of the skull, or is just within the stylo-mastoid foramen. If the sense of taste in the anterior portion of the tongue is affected, the lesion is in the Fallopian canal. If complete deafness occur with the facial palsy, disease in the trunk of the nerve at the base of the brain is indicated, while, if there is associated paralysis of the sixth nerve, the lesion is probably located in the pons.

Etiology and Pathology.—Facial paralysis may be due to a lesion involving any part of the facial nerve-tract from the motor centre in the lower Rolandic area of the cortex to the face-muscles of the opposite side. If the lesion lie in the cortex or between cortex and facial nucleus in the pons, we have a "supranuclear" facial paralysis. If the lesion involve the nucleus in the pons, we have to deal with a "nuclear" paralysis. If the fibres of the nerve itself be affected, the term "infranuclear" is applied. A supranuclear or central paralysis is usually seen in association with a hemiplegia; the electrical reactions remain unaltered, the upper muscles of the face are but little involved, and voluntary movements are more impaired than is the power of emotional expression.

The peripheral form of Bell's palsy, or facial paralysis, that arising from lesions

of the nerve-trunk or nerve-roots in the pons, is one of the most common of the peripheral paralyses. It is more often seen in early middle life, and in men than in women. The great majority of the cases have as their basis a neuritis of the facial nerve, due to exposure to cold. Such cases are sometimes referred to as "rheumatic." Other causes are injury to the nerve-fibres, as from accidental cutting during surgical operations upon the neck, or from blows, compression, temporal-bone disease, etc.

Treatment.—The pathological process underlying the paralysis, when such exists, should be first dealt with. In the common neuritic cases a mercurial purge should be given in the beginning, followed by counter-irritation over the affected nerve-trunk, in the form of a blister, the actual cautery, or a strong galvanic current. The internal administration of salicylates or salol, continued for some days, is advisable. Iodide of potassium is almost always beneficial, even in cases destitute of syphilitic taint. It should be given in moderate doses, continued for a long time. After subsidence of the acute symptoms facial massage and the local application of the faradic current in strength sufficient to produce muscular contraction will serve to hasten restoration of power to the paralyzed muscles.

Localized Neuritis.

Disorders of the GLOSSO-PHARYNGEAL, or ninth pair of cranial nerves, are attended by perversions of the sense of taste, as well as by abnormalities of common sensation and motion in parts to which the nerve is distributed. The nerve may be affected alone, but is most often involved, along with the hypoglossal, in the (nuclear) changes of bulbar paralysis.

The PNEUMOGASTRIC nerve, with its

extensive distribution and varied functions, gives, when affected by disease, a many-sided clinical picture, the more prominent features being cardiac irregularities and gastric disorders. The nerve is rarely alone involved, but not infrequently participates in the morbid changes of multiple neuritis, or beriberi. It may also be affected from injury, as a result of pressure from a tumor, etc. The tachycardia and acute gastric symptoms pertaining to disease of the pneumogastric nerve have already been referred to under multiple neuritis.

Some of the cases of "nervous" dyspepsia are attributable to disorder of the vagus. Some forms of paralysis of the larynx and pharynx, as well as some of the laryngeal neuroses, depend upon disorder of this nerve.

In 15 recorded instances in which the pneumogastric was accidentally involved in malignant disease or merely in accidental injuries 11 died and 2 recovered, while in 2 instances the result was not reported. It is impossible to separate the causes of death so far as distinctly to state whether death was due to lesion of the nerve-trunk itself or to coincident lesions of other important structures.

Of 50 other cases the result is left in doubt in 2 instances, while, of the remaining 48, 21 died and 27 recovered. Here, too, in the fatal cases, it is impossible to say that in any instance death was due to injury of the nerve.

The preponderance of testimony is in favor of the comparative safety of attacking this nerve when involved in disease and when too much other operating is not necessitated by the condition for which intervention is undertaken. Roswell Park (*Annals of Surg.*, Aug., '95).

The SPINAL ACCESSORY nerve may be affected by a neuritis, rheumatic or other, or by injuries, tumors, etc. The result is paralysis or weakness of sternomastoid and trapezius muscles. Spasmodic wryneck is sometimes traceable to spinal accessory disease.

The HYPOGLOSSAL nerve is often involved as a part of a bulbar palsy, or in course of general paresis or other degenerative nervous disease. The prominent symptoms are paralysis and atrophy, with fibrillary tremor in the side of the tongue, with deviation of the tongue toward the sound side.

Inflammation of Spinal Nerves.

The noteworthy diseases of the spinal nerves are the general conditions of neuritis, degeneration, etc., already described; the painful affections included under the term neuralgia (*vide infra*); and the affection known as sciatica, now to be dealt with.

Sciatica.

This is to be regarded as a form of neuritis chiefly interstitial in character, the pathological changes being located in the nerve-sheath. In severe cases the nerve-fibrils are also affected. The lesion is usually localized at the sciatic notch and near the middle of the thigh, and the pathological alterations shown are those of simple neuritis, previously sketched.

The malady is most common in middle life, and is seen more frequently in men than in women. The remote or predisposing causes are general malnutrition; rheumatic, gouty, and uric-acid diatheses; digestive defects, syphilis, and anything which lowers general vital tone. The exciting causes are exposure to cold, muscular overstrain, and direct injury, as from pressure or blows.

Literature of '96-'97-'98.

A careful examination of the pelvic viscera will frequently reveal the cause of a sciatica, prolapse of the uterus with retroversion, prolapse of the rectum, an inflamed ovary or testicle, varicocele, an inflamed or tender prostate, and hæmorrhoids are especially conducive to sciatica, while fissure in ano, stricture of the rectum, stricture of the

urethra, impacted fæces, and tumors in the pelvic cavity are also causes. Pressure along the course of the nerve, continued for a long time, may produce an attack of sciatica, as will, also, exposure to cold. F. B. Bishop (Virginia Med. Semimonthly, July 8, '98).

Symptoms.—The characteristic symptoms of sciatic neuritis are pain and tenderness along the course of the sciatic nerve, with weakness and a sensation of stiffness in the muscles. The onset of the pain is usually gradual, it being at first felt only on exertion, but, as it becomes more severe, being constant. It is at times a dull ache; at others a sharp lancinating or acute burning pain. Formication, tingling, and some degree of anæsthesia are common. In later stages there is some atrophy of the calf and other muscles supplied by the sciatic nerve, and in a few instances the disease extends to the lumbar plexus of nerves.

Trophic disorders, as œdematous swelling and herpes, are of not infrequent occurrence.

In about one-third of the cases of sciatica personally seen during the past eight years loss of the knee-jerk on the affected side noted. Raven (Brit. Med. Jour., Mar. 19, '92).

Literature of '96-'97-'98.

Attention called to the abolition of the tendo-Achillis reflex in sciatica, and its value indicated as a differential sign between true sciatica and hysterical pseudosciatica. J. Babinski (La Méd. Mod., Oct. 26, '98).

The disease endures for weeks, months, or even years, although eventual recovery is the rule. Most cases last for months. The more acute and severe the initial symptoms, the longer the case will probably last. An obstinate form of neuralgia may persist after the other symptoms of sciatic neuritis are entirely gone. Secondary sciatic neuritis, from

pressure of a tumor or a similar cause can, of course, be relieved only after removal of the cause.

Treatment.—In the treatment of sciatica the first requisite is absolute and complete rest of the limb, all movements which give the least pain being scrupulously avoided. Simply confining the patient to bed may answer in many cases, but in the aggravated forms placing the limb in splints is advised. Hot applications, as hot poultices, superheated air, etc., are grateful in relieving the pain, while occasionally *ice* is more useful. Counter-irritation by the actual cautery gives great relief sometimes. A strong galvanic current is always of service. The local hypodermic administration of drugs is preferable to the use of drugs by the mouth. Cold water injected into the muscles gives great relief. Acupuncture is frequently of great value. Where local remedies fail the internal administration of coal-tar products or morphine may be necessary.

Surgical measures, such as nerve-stretching, splitting the sheath, etc., may be tried as a last resort. The diet should be liberal and the general bodily state improved as much as possible by tonics and hygienic measures. In the later stages of the malady electricity and massage should be used systematically, as they shorten the period of convalescence.

Good results obtained in sciatica and intercostal neuralgia from painting a mixture of equal parts of guaiacol and glycerole over the course of the nerves. Ferrand (Jour. des Prat., No. 30, '94).

Three obstinate cases of sciatica successfully treated with trinitrin prescribed in the following form:—

R Solution of trinitrin diluted to $\frac{1}{100}$,
 $\frac{1}{2}$ drachm.

Tincture of capsicum, $1\frac{1}{2}$ drachms.
Mint-water, 3 drachms.

M. Sig.: Three drops to be taken 3

times daily. Mikhalkine (Revue de Thér. Médico-chir., Feb. 15, '95).

In sciatica patient should be confined to bed and the leg immobilized by a long hip-splint. Hot-water bags are to be kept continuously under the thigh from the sciatic notch to the popliteal space. Once a day galvanism is used for five minutes, the negative electrode being applied to the sole of the foot, which it should equal in size, and the positive one equally large, placed under the hip as the patient reclines. Fifteen-grain doses of phenacetin are administered for the acute pain in the beginning, or, if necessary, an hypodermic of morphine may be given. Græme Hammond (Post-graduate, Sept., '94).

Literature of '96-'97-'98.

Cases of good results from use of salophen in sciatica. From 45 to 75 grains were given a day. Unpleasant effects were either wholly wanting or very transitory. Luigi Cappellari (Gazz. degli Osp., No. 35, '96).

Nitroglycerin, in doses of 1 minim of the 1-per-cent. alcoholic solution and increasing up to 5 minims three times daily, successfully given to seven patients suffering with sciatica. In the acute cases they recovered in from ten days to a month; in the chronic cases they improved notably and gained daily. Only discomforts arising from the use of this drug were congestive headaches and flushing of the face sometimes following the first dose of the medicine, while in others they did not supervene until the maximum doses were administered. To counteract these effects the bromides may be used. If after a period of administration of ten days no perceptible effects have been obtained, it should be abandoned. Treatment of anæmic conditions, diathesis, and local causes must be considered and carried out in conjunction with the special treatment. W. C. Krauss (N. Y. Med. Jour., Feb. 29, '96).

One hundred and thirteen cases of rebellious sciatica in which compression resulted in recovery. Patient lies on his face, with his legs extended and resting easily one against the other. The most

painful spot is selected: the region where the nerve proceeds from the large sciatic opening. On its trunk both thumbs are applied and it is compressed with the greatest possible force; at the same time slight lateral movements are made without changing the point of pressure or moderating its intensity. This takes from fifteen to twenty seconds, and is followed by an interval of twenty minutes' rest, when the procedure is repeated. After a second application patient is able to walk, and for several hours, or even a day, he may be free from pain.

In order to obtain complete recovery, this procedure should be practiced about six times a day every two days, until definite suppression of neuralgia is obtained. M. Negro (*Bull. Méd.*, Jan., '96).

In sciatica deep injections of glycerophosphate of soda recommended very highly. One to two cubic centimetres of a 25-per-cent. solution are to be injected deeply into the muscle as near as may be to the nerve. Of 63 cases treated in this manner, 41 were cured, 18 ameliorated, while in only 4 was the treatment a failure. Constitutional treatment is not to be neglected when the neuralgia is a symptomatic one. Albert Robin (*Bull. Gén. de Thér.*, May 30, '97).

Deep injections of antipyrine into the muscle in the region of the sciatic nerve promptly relieves sciatica. A long needle is employed, and the injection made at a point nearly midway between and a little below a line drawn from the tuberosity of the ischium to the great trochanter, the antipyrine solution being slowly injected at a vertical depth of about half the length of the needle. Kühn (*Sem. Méd.*, xviii, p. 54, '98).

In the treatment of sciatica by electricity each case must be a law unto itself. Splendid results obtained personally from a high tension, alternating current, combined with the direct current. F. B. Bishop (*Virginia Med. Semi-monthly*, July 8, '98).

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NERVES, WOUNDS AND INJURIES OF.

Wounds of Nerves.

In civil life division of nerves is frequently met with among mechanics, as the result of machinery accidents, cuts with sharp tools, chisels, knives, etc. Brawls are common causes of such accidents, breaking of glass bottles and tumblers or suddenly thrusting the arm through a window offering ample opportunities for deep cuts involving the division of one or more nerves. In military life the nerves are frequently severed in the course of gunshot wounds, saber-cuts, bayonet-thrusts, etc.

Symptoms.—Whether the division of a nerve occur as the result of contusion, compression, or of any of the factors just enumerated, the symptoms are practically the same. There is functional disturbance, sensory and motor, in the area to which the severed nerve is distributed. The symptoms attending other injuries,—pain, shock, hæmorrhage, etc.,—however, vary greatly in intensity, and in no way correspond to the severity of the lesion present. Thus, a slight wound in which a small nerve has been divided may give rise to intense pain, great shock, loss of consciousness, etc., while a much more serious lesion, involving several nerves, may hardly give rise to any immediate symptoms, local or constitutional. The immediate signs, therefore, do not convey reliable information regarding the severity of the injury or afford a clue to the extent of the lesion. The sensory or motor disturbances, the changes observed in the area of distribution, and the remote symptoms afford far more valuable *data*.

REFLEX SYMPTOMS.—Small nerves, when cut, often give rise to paresis of remote regions. Thus, a slight wound of the thigh may be attended by paralysis

of the other thigh, of the arm on the opposite side, etc. All the muscular system may, in fact, be paralyzed, the result, according to Mitchell, Morehouse, and Keen, of exhaustion of nerve-centres of motion and sensation. Injuries of the ear may give rise to spasmodic cough, or traumatism on one side of the neck may cause palsy of some of the muscles of the arm and leg of the opposite side, etc. Shock and fainting in slight wounds—vaccination, for instance—may thus be produced.

MUSCULAR POWER.—Loss of muscular power is easily determined by the use of the dynamometer or, better still, the dynamograph.

The former shows the amount of power exerted by the hand upon the spring; the latter simultaneously gives a tracing of the regularity with which the muscle acts.

The strength of the muscles of the lower extremities can be tested by requesting the patient to jump on "tip-toe," as suggested by Gowers. Again, the strength of the various muscles may be ascertained by causing the patient to perform some special movement bringing the suspected muscle into use.

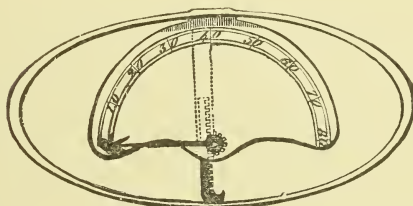
Loss of muscular power is, obviously, a valuable diagnostic symptom if it is not merely ephemeral (a blow, pressure, etc., causing temporary paralysis of motion) and is sustained by the other signs indicating loss of nervous function, deficient nutrition, and impaired electrical reaction. (See **PATHOLOGY.**)

LOCAL TEMPERATURE.—The area to which the branches of the severed nerves are distributed is often unduly cold. Indeed, this hypothermia has reached to 81° F., a difference of seventeen degrees from the normal (Kraussold and Rohden). As a rule, the local temperature varies from 96° to 93° F. Occasionally,

however, the temperature is higher than normally, the excess ranging from 1° to 9° F.

SENSATION.—The skin over the area to which the cut nerves are distributed may be anæsthetic or hyperæsthetic. In the latter case the patient complains of a sensation of formication, pricking, or pain. The suffering is sometimes intense, a violent burning pain causing the patient to resort to various means of relief: allowing cold water to run upon the part, filling his shoes with cold water if the lesion be one involving the foot, etc.

Although complete division of a sensory nerve is likely to cause definite loss of sensation, the latter may continue nevertheless, owing probably to nerve-



Mathieu's dynamometer.

anastomosis. A long section of the musculo-spiral may, for instance, be removed without causing loss of sensation corresponding to the radial (Moullin). The fact that after some time the area of anæsthesia sometimes becomes smaller also suggests that collateral branches are developed or that the neighboring nerves, acting vicariously for the trunks which are divided, are able to extend their sphere of influence. Again, one region may be absolutely anæsthetic, while an area immediately adjoining may be much less or irregularly so.

To determine the exact degree of sensitiveness present, the patient should be blindfolded and the gentlest means should be employed. A feather may be

used, or, when there are hairs on the surface, delicate stroking of these will often be sufficient. A pair of compasses and a foot-rule offer ready means when hyperæsthesia is not present. Comparison between corresponding areas on both legs, or both arms, or both sides of the trunk, taking care that the same conditions are observed, will then indicate to what degree the areas of the affected part differ from the corresponding ones. The condition of the temperature sense may be determined by applying to the skin mops thoroughly soaked in water of a known temperature or dipping the extremities in the latter, or alternately in hot or cold water.

CUTANEOUS SYMPTOMS.—The skin usually appears congested and red, but it may be bluish red, very pale, or œdematous. It is usually dry, but a contrary condition sometimes prevails, drops of perspiration, giving off an unpleasant odor, covering the entire field involved. The nails may assume a curved, turtle-shell-like shape, become furrowed, and undergo ulceration. This destructive process may involve the phalanges and end in gangrene of the finger-tips. Periostitis sometimes occurs. Various cutaneous affections, eczema, herpes zoster, pemphigus, etc., are also observed.

JOINTS.—The joints are occasionally involved secondarily, arthritis developing as the result of injury, not only of the nervous supply of the limb, but also, at times, of lesions of the cerebro-spinal system. These arthropathies so simulate acute rheumatism sometimes as to suggest the actual presence of the latter disease. Effusions into the joint, adhesive inflammation ending in ankylosis, dislocations of the articular surfaces, and even destruction of the entire joint have been noted.

WASTING.—As soon as the nutrition

of the muscles is impaired through solution of continuity of their nervous supply, marked evidences of wasting soon appear. Atrophy following division of a nerve is of the most pronounced kind; the muscular structure, after a period of connective-tissue proliferation, completely disappears, leaving a mass of hard, fibrous tissue in its stead. The process of degeneration is accompanied by gradual contracture, the effects of which are deforming in proportion as the insertions of the affected muscles are far from the trunk. The hands often suffer in this connection, their usefulness being totally destroyed in some cases. The differential reactions shown by affected muscles when the electrical current is applied to them are very important; they are considered under **PATHOLOGY**.

Pathology.—When a nerve is severed, it begins to degenerate, the process following the direction of the nerve-current. If a motor nerve be cut, the degeneration will proceed in the same direction as motor impulses; these radiating from the spinal cord outwardly, it will extend from the point of section toward the periphery, while, if a sensory nerve be severed, the degeneration will advance toward the spinal cord. Proceeding with rapidity, the destruction is sometimes completed within a few weeks. The entire peripheral segment, in the case of a motor nerve, becomes fatty and granular and its myelin and eventually its axis-cylinder undergo disintegration. In the case of sensory nerves, the process may extend into the spinal cord and even into the brain.

Literature of '96-'97-'98.

Changes occurring in nerve-cells after resection of their axis-cylinders are divided into three phases: Reaction, repair, and degeneration. Reaction is characterized by solution of the chromo-

philic bodies and dislocation of the nucleus. During repair the body of the cell swells and the nucleus returns to its normal position. The hypertrophy reaches its maximum in about ninety days, and the cells appear perfectly normal, excepting that they are somewhat darker than usual. In the course of twenty days more the distinction between the normal cells and those in a state of repair has almost disappeared. When the nerve is torn out and its repair thereby prevented, the reaction-period is complete in the course of about twenty days. Then, instead of swelling and becoming pycnomorphous, the cells lose their chromophilic substance, and become smaller, and in the course of a month may have disappeared, and the others are atrophic. The protoplasm has become translucent, the nucleus smaller and deformed, and, occasionally, the achromatic substance shows alterations. A few cells are very dark in color, partly from the retention of the chromophilic substance and partly from the staining of the cell in mass. G. Marinesco (*Neurol. Centralb.*, Oct. 1, '98).

A muscle supplied by a severed motor nerve responds in a different way to the action of the galvanic current than one normally supplied. While in the latter case the cathodic (negative) closure contraction (K.Cl.C.) is more marked than the anodic (positive) closure contraction (A.Cl.C.), the opposite is the case when the nerve has been cut. In other words, the application of the negative current causes a more marked contraction than the positive current, whereas in the normal state it is the negative current that gives rise to the stronger contraction. The former is termed the "reaction of degeneration."

PRIMARY UNION.—The subsequent course of the injury depends upon the proximity of the two ends. If they are sufficiently close, union by first intention occurs, nerve-fibres being capable of undergoing primary union in the same man-

ner as other tissues. The process starts from the nuclei and from the protoplasm of the sheath of Schwann (Büngner). There occurs rapid proliferation of the axis-cylinder and neurilemma of the proximal nerve-fibres, and these, once brought into contact with the peripheral portion of the divided nerve, retard and finally arrest the degenerative process. As soon as the union is sufficient to afford a suitable conductor for nerve-impulses (Vanlair) the process of repair begins, and continues until the functions are restored. In a case reported by Notta all the nerves cut some distance above the elbow were thus regenerated within six months.

DELAYED UNION.—When the ends are not in apposition the pathological changes depend to a degree upon the distance between them. Even here, if the ends are not too far apart, reunion with true regeneration of the nerve-structure often occurs, the axis-cylinder and the myelin being regenerated to a more or less perfect degree. Repair may take place when the ends are an inch apart, and, doubtless, as shown by a few reported cases, even when a much greater distance exists. Schiff, for instance, witnessed complete restoration of conductivity after a piece two inches long had been excised from the vagus of a dog. Still, such a result should not be taken as a guide in practice.

Fifty-five cases of section of nerves seen, some sutured and some not, and the notes examined of over two hundred and fifty cases of sectioned nerves with more or less complete recovery. The possibility of primary union is denied. The cases reported as instances of primary union believed to have been cases where sensation alone, and not motion, had been studied, the return of sensation having depended upon anastomosis, and not upon reunion of the cut nerve. In favorable cases motion will be found

to return as soon after secondary as after primary suture. The degeneration which follows every section necessarily occupies many weeks, and these may pass without the nerve's being united. J. K. Mitchell (*Jour. Nerv. and Mental Dis.*, June, '95).

Literature of '96-'97-'98.

After suture of nerves early return of sensation must be regarded as indicating a restored conductivity of the divided nerve. The imperfect or non-return of motion must be taken to imply atrophy or destruction of the muscles. Microscopical examinations reported. Both central and peripheral portions of un-united nerves contain bundles of young nerve-fibres, to the sides of which spindle-shaped nuclei are attached at frequent intervals. Where the nerve-ends were united by a cicatricial segment without conductivity's being restored, the segment was found to consist of a dense net-work of connective tissue containing bundles of young nerve-fibres in its meshes. Portions excised from the central ends of the nerves showed no trace of old myelin-fibres or of degenerated fibres, but were made up of bundles of young nerve-fibres, which could be seen taking origin within the old sheaths of Schwann. No evidence was found of Krause's ascending degeneration, the old axis-cylinder and myelin-sheath being destroyed in the peripheral segment in the ultimate portion of the central segment.

Young nerve-fibres are developed in the peripheral segment as well as in the end of the central segment, even while there is no connection between the two. These young nerve-fibres arise within the old sheath of Schwann from the protoplasm and nucleus of the interannular segments. The spindle cells formed from the protoplasm and nuclei of the interannular segments elongate and unite to form protoplasmic threads with the elongated nuclei attached to their sides. The central portion of the protoplasmic thread develops into the axis-cylinder, while myelin is deposited in drops in the outer portions, the protoplasm of which remains with the nucleus as the neuro-

blast of the new interannular segment. As long as the conductivity of the nerve is not re-established the development of the fibres proceeds only to a certain stage, and, as the new fibres three and eighteen months after division present the same characters, this stage may be regarded as a resting stage, depending, for its further development, on re-establishment of function. The cicatricial intercalary segments of a spontaneously-reunited nerve may be permeated from end to end by young fibres without re-establishment of function if the amount of cicatricial tissue present in the mass is sufficient by its pressure to prevent the passage of impulses. Robert Kennedy (*Report to the Royal Soc.*, Feb. 11, '97).

Prognosis.—While sensation and motion are about equally affected immediately after the injury, sensation is usually the first to return. The improvement is generally rapid when suitable conditions of repair prevail. The chances of complete recovery, however, greatly depend upon the nature of the injury and the time elapsed between the accident and the time the remedial measures are instituted. When the muscles are not completely degenerated, much can be done with persevering treatment—months and even years being sometimes required to bring about a satisfactory result. The rapidity with which degeneration begins in the nerves and the early involvement of the muscles render it imperative, therefore, that in all cases of nerve-injury active measures should be resorted to at once.

Treatment.—The treatment of a wound in which the presence of a nerve-lesion is demonstrated by characteristic symptoms does not differ from that of any other,—including strict asepsis,—but the nerve-ends should, whenever possible, be sutured.

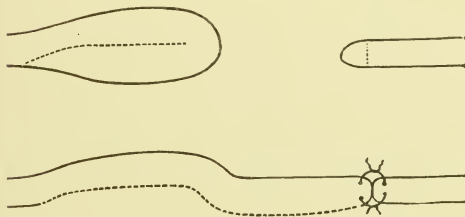
PRIMARY SUTURE.—An analysis of 117 cases, in which immediate suture of a

divided nerve had been performed, led De Forest Willard to conclude that a good prognosis, not only of sensation, but also of motion, was thus afforded. The cases showed that clean end-to-end suture and a careful freeing of the ends for some distance from cicatricial tissue afforded the best chance for a restoration of function. The best suture-material was found to be fine chromicized catgut, inserted, by means of a small, round needle, directly through the body and sheath of the nerve. Two sutures crossing at right angles were usually advisable. During the healing process the part was completely at rest and the nerve relaxed when possible. Strict antisepsis is, of course, required. Stretching if the ends are not in contact may be resorted to. In 81 cases analyzed by Bowlby, 32 cases were entirely and 34 partially successful, while only 14 did not progress satisfactorily. In all such cases the reparative process is exceedingly slow, and the patient should be carefully warned of this fact.

Case in which the two ends could not be brought together without too much tension; so, after freshening the lower end, the bulbous portion of the upper end was split down the greater part of the way and sutured down to be united to the lower end, as in the figures on next page. Duncan (Clinical Jour., Dec. 21, '92).

SECONDARY SUTURE.—Success has also attended many cases in which nerve-suture was performed long after the injury: years in some instances. In a few, sensation, to say nothing of motion, had long disappeared. De Forest Willard also analyzed 132 cases: a sufficient number to demonstrate that the fears of tetanus entertained some years ago were groundless and that secondary suture offered good hope of success, and should be attempted, even years after the accident.

Repeated operations may ultimately succeed, and efforts to repair the results of injury should therefore be renewed. Restoration of function may take place many months after the operation, sensation returning first. Though the distal portion of a divided nerve rapidly degenerates, as does an interposed graft, transmission of function is possible and regeneration may take place both as regards sensation and motion. Strict antisepsis must prevail and the nerve well exposed, the limb being surrounded by an Es-march bandage. The bulbous proximal end is easily found, but to reach the distal end the tissues must be slit along the course of the nerve. The bulbous



Suture of nerves. The upper figures indicate the position before suture, the lower figure after suture. The dotted lines indicate the incision. (Duncan.)

end is cut off and a small piece (one-quarter inch) of the distal also; the two ends are then stretched and united as in the case of immediate suture. Out of 73 cases, Bowlby's statistics only include 15 complete failures. Various methods of end-to-end suturing are shown on the following page.

In some cases the ends of the nerves cannot be brought together even in primary operations, owing to destruction of a portion of the nerve. A flap may then be taken from the nerve, as shown in the annexed cut, and reflected over to the other end of the nerve. Return of sensation and cure in one year has been

obtained from this operation, but it often fails.

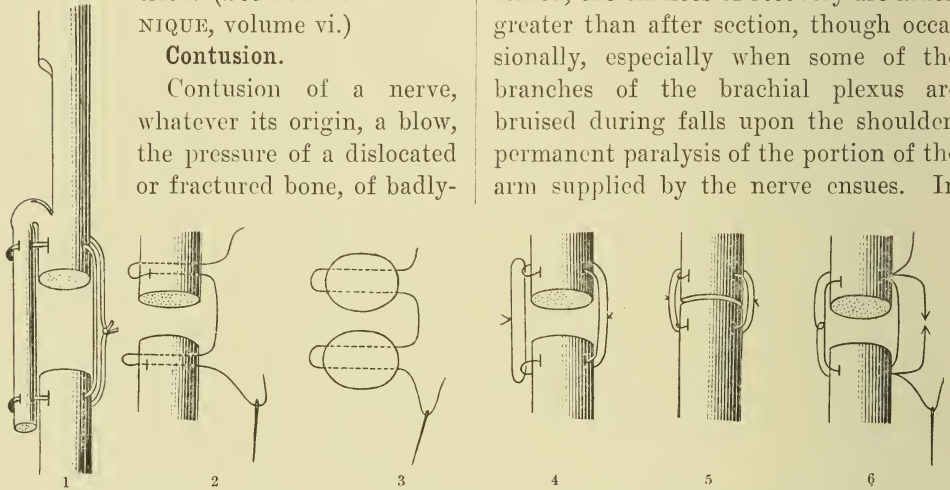
Other measures proposed have been to shorten the limb by excising a piece of the bone: an operation hardly to be recommended. Better than it is the Després method, which consists in splicing the distal end of the injured nerve into an adjoining nerve, by separating the fibres of the latter. When these measures do not succeed, nerve-grafting should be tried. (See SURGICAL TECHNIQUE, volume vi.)

Contusion.

Contusion of a nerve, whatever its origin, a blow, the pressure of a dislocated or fractured bone, of badly-

jury, local heat and tingling at the peripheral ending of the nerve struck, while destructive crushing may be attended by no pain whatever, but with loss of sensation and of muscular power, followed by wasting. At times neuritis follows, with paralysis as an occasional consequence, complicated with disorders of nutrition of the cutaneous tissue, the nails, etc.

The continuity of the nerve being preserved, the chances of recovery are much greater than after section, though occasionally, especially when some of the branches of the brachial plexus are bruised during falls upon the shoulder, permanent paralysis of the portion of the arm supplied by the nerve ensues. In



1, Nerve-suture by means of a flap. 2-6, Methods for the separation of severed nerve-ends. (*Trnka*.)

(*Centralblatt für Chirurgie.*)

padded crutches, malposition, forceps pressure during delivery, etc., produces mechanical lesions involving more or less laceration of the nerve-fibres, sometimes complicated with hæmorrhage into the nerve-substance. In severe cases the myelin may be gravely involved, and the nerve suffer local destruction.

Symptoms.—The clinical signs vary greatly with the nature of the injury, the more acute symptoms often attending slight lesions, while complete destruction may not give rise to suffering. A slight blow may, for instance, momentarily suspend the conductive power, occasion quite severe pain at the seat of the in-

jury, local heat and tingling at the peripheral ending of the nerve struck, while severe neuritis with pain in the parts to which the nerve is distributed and trophic disturbances are occasionally observed.

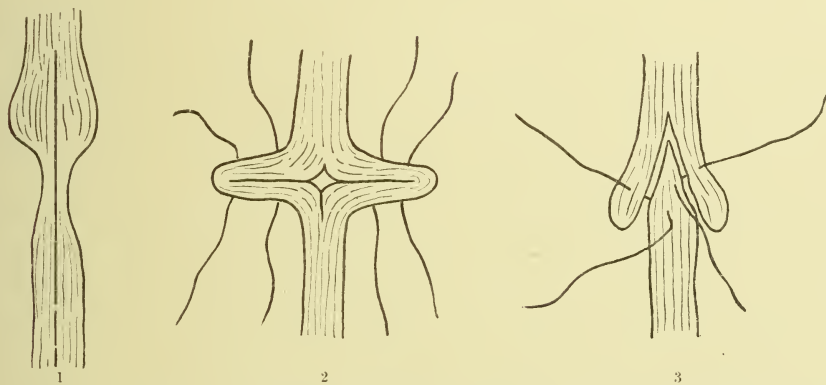
Diagnosis.—The extent of damage to the nervous supply of a contused region may usually be determined with the aid of electricity. If the muscle reacts normally to the faradic current, applied several times at intervals of about two hours, the injury is *nil* or slight. If, on the contrary, the reaction shows a tendency to become less marked or to disappear, the injury is severe, though not necessarily

destructive; if it is completely interrupted or the region supplied by it gives the reaction of degeneration, the probability is that the continuity of the nerve has been interrupted; if, in addition, wasting of the region occurs, the likelihood that the nerve is torn apart by crushing is proportionately great.

Treatment.—The treatment depends upon the extent of the injury. If the latter is not severe and the faradic—though reduced—excitability persist, thorough rest of the part, splints being used for the extremities and retention bandages for the trunk, will be followed

slight and the chances of a reunion is increased in proportion. An important feature of these cases, however, is that the contusion usually involves the surrounding tissues and especially their vascular supply. The vitality of the parts is correspondingly reduced. Warmth, calculated to facilitate the local circulation and nutrition, should therefore be sustained by suitable covering: cotton-wool and, if need be, hot-water or hot-sand bags.

As soon as the inflammatory stage has passed, means calculated to enhance local nutrition should be resorted to. Massage,



Suture of nerves. 1, Longitudinal incision through cicatrix, extending into normal nerve-substance on either side. 2, Incision in 1 united transversely. 3, Nerve-stumps united by the wedge method. (*Gleiss.*)

(*American Medico-Surgical Bulletin.*)

by prompt recovery. The treatment of the bruised tissues surrounding the nerves will answer all purposes. If pain be present, morphine injected hypodermically in the nearest uninjured tissues may be employed. The addition of $\frac{1}{120}$ grain of atropine in the case of an adult greatly enhances the anodyne effect of the opiate. If the injury be severe and the electrical indications that the nerve has been torn are present, the treatment becomes that of incised wounds (*q. v.*), but in subcutaneous injuries the likelihood that the nerve-ends are far apart is

frictions, and galvanism are the most active means at our disposal. Galvanism is more effective than faradism. Daily sittings of ten minutes each are sufficient, a weak current being employed. The parts should be thoroughly wetted to insure penetration.

Compression.

Compression, as here understood, applies to that resulting from the pressure of a tumor, an aneurism, scar-tissue, callus, etc., or an external agent such as an encysted bullet, a splinter, etc., or from pressure between a neighboring

bone and an external object, as occurs frequently in persons using crutches, or when both arms are held under the head during sleep. Dislocations, especially those of the head of the humerus, often give rise to compression, while the heel of a careless surgeon's shoe when forced into the axilla during the process of reduction occasionally adds to the dangers of the occasion. Fractures of the humerus are often attended by lesions of the musculo-spiral, while fractures of the clavicle are frequently accompanied by pressure and laceration of some of the branches of the brachial plexus. In obstetrical practice the child's head is sometimes so compressed by forceps as to conduce to palsy of the seventh pair.

The symptoms and diagnostic features do not differ from those described under contusion.

Treatment.—The condition acting as cause must first of all be removed if possible. When an extremity is the seat of trouble, this can usually be accomplished, even aneurisms being subject to cure. When a deep-seated nerve of the trunk is compressed, however, the difficulties are greatly increased and a satisfactory operation cannot always be resorted to. After removal of the cause the aim should be to encourage nutrition of the area of distribution by arsenic or strychnine, along with the electrical treatment recommended above under **CONTUSION**.

NETTLE-RASH. See **SKIN DISEASES: URTICARIA**.

NEURALGIA AND MIGRAINE.—The several forms of neuralgia and headache bear a close etiological and pathological relationship to one another, being the outcome of functional or neuritic disorder of the centres or peripheral portions of the sensory cranial or

spinal nerves. The differentiated varieties of these painful neuroses arise from location and function of the nerve affected, and from complicating or underlying morbid states.

Neuralgia.

Definition and Varieties.—Neuralgia is a functional or mild neuritic disorder of the sensory nerves or their centres, characterized, as the name indicates, by pain. The affection may be idiopathic—depending upon some functional disturbance alone, or it may be symptomatic—due to some organic disease of the nerve or to some disease or pathological state outside of the nervous system, such as neuritis, anæmia, and toxæmia. The tendency of later years is to diminish the number of idiopathic neuralgias by the discovery of organic disease with demonstrable pathological changes in the nerve-trunks.

Neuralgias are classified according to their causes, as "neuritic," "toxic," "gouty," "rheumatic," etc.; or according to their location, as "trigeminal," "sciatic," "intercostal," "cervico-occipital," etc. The general features of the disorder will be first discussed, and after this the more important clinical varieties will be briefly described.

Symptoms.—Pain is the chief and characteristic symptom, the onset of the pain being sometimes preceded by soreness and stiffness in muscles and tissues of affected part, sometimes developing suddenly and without warning. The pain is intermittent or paroxysmal, of a darting, stabbing character, accompanied sometimes by burning and tingling sensations. There is usually tenderness over the entire nerve-trunk, with certain "painful points" at which the tenderness and pain is greatest. The paroxysms of pain may occur only at long intervals, but usually, for some hours,

they occur every few minutes; in aggravated cases may be nearly continuous for hours or days. In occasional cases there may be some pain continuously for months or even several years. In some instances the pain is greatest at a certain time each day, the seeming periodicity being most marked in malarial cases, although seen where there can be no thought of malarial influence.

Trophic and vasomotor disturbances in affected area, such as coldness, eruptions, falling out or changes in color of the hair, etc., are occasionally seen. In some forms of neuralgia twitching or spasm of adjacent muscles accompany the paroxysms.

Literature of '96-'97-'98.

Numerous cases of paræsthetic neuralgia have been recorded by Roth and others, in which there is gradual development of burning pain and uneasy feelings, and sometimes anæsthesia in the antero-lateral portion of one thigh noted. The pain may be sufficient to prevent walking. The condition has been thought to be due to compression of the external cutaneous nerve either by the psoas muscle or otherwise. Three somewhat similar cases where there was monoerural paræsthesia personally recorded. In each case the physical examination was negative. The duration of the affection varied in these cases from one month to eight years. Osler (*Jour. of Nerv. and Mental Dis.*, Mar., '97).

Diagnosis.—The diagnosis of neuralgia is simple, the presence of the characteristic pain being sufficient. The only practical difficulty is in distinguishing between neuralgia and neuritis; and here, since the conditions shade into one another, it may be impossible to draw a sharp dividing line. Generally speaking, the pain in neuritis is more constant in location than is the pain of neuralgia; it does not shift nor dart from one nerve to another; there is in

neuritis much more muscular weakness, stiffness on movement, and relaxation of tissues, and absence of the history of repeated attacks.

Literature of '96-'97-'98.

From therapeutic point of view it is important to distinguish two classes of facial neuralgia: the first transitory and usually due to cold and peripheral irritation, the second refractory and perhaps incurable. First form: Pain during attacks is less intense, but is seldom entirely absent between them. Onset is sudden, then there is an acme and a decline. Second: *Tic douloureux* is completely paroxysmal, pain being entirely absent in intervals; its maximum intensity is reached quickly, and it ceases as suddenly as it came, the whole attack being of short duration. There may be ten to one hundred attacks in the day, which are often brought on by physiological acts or come on spontaneously. Patients compress the painful spot, and the face is contorted. Secondary vasomotor symptoms are injection of eye, œdema of eyelids, discharge from one nostril, etc. If the lingual nerve is affected the mouth fills with a copious secretion. Herpes along the nerve is common. Most often the neuralgia lasts some time (weeks or months), and then vanishes completely for a period. However, as age advances these intervals tend to become shorter and the painful periods longer until the disease is permanent. An hysterical form can be distinguished from the true by the irregular occurrence of the attacks.

The first form of neuralgia is always benefited by analgesics (antipyrine, phenacetin, hydrobromate or valerianate of quinine); the second, or true tic, is quite uninfluenced by them. The only drug which can be relied on in the latter is opium in large doses. It may be given in pills containing 2 centigrammes of the thebaic extract of the French pharmacopœia, made freshly and not too hard. Three a day are given at first, and, the effect being carefully watched, one pill is added every other day until the desired effect is produced. This dose

is continued for a few days, and then diminished by one pill every other day. Gilles de la Tourette (*Sem. Méd.*, June 24, '96).

Etiology.—Neuralgia is a disease of middle life, rarely affecting children and rarely occurring in old age. It is somewhat more frequent in women than in men; more frequent in cold than in warm weather; more frequent in cold and damp climates than in dry and warm localities. Members of neuropathic families are more liable to the disease than are persons of good nervous heredity. The immediate exciting causes are anything which lowers general nerve-tone and any toxic agent or disease attended by toxæmia, such as anæmia and general cachectic states, malaria, infectious diseases, autogenous poisonings, diabetes, lead poisoning, etc. Exposure to cold may precipitate attacks in those predisposed, as may reflex irritations from disease of eye, ovaries, abdominal organs, carious teeth, etc. Where hereditary predisposition is very strong the affection may develop without discoverable cause. The neurasthenic and hysterical are particularly prone to suffer from neuralgia.

In many cases of neuralgia, the true "functional" or idiopathic cases, no pathological alterations in the nerve-fibres, cells, or ganglia can be detected, the presumption being that the pain is due to malnutrition or toxæmias of a degree too slight to cause alterations of structure. In other cases the nerve-trunks are swelled and tender, and in most such cases the pathologico-anatomical changes of a mild interstitial neuritis.

Cases of interstitial and splanchnic neuralgia in syphilitic parents where no other cause than the syphilis could be found. Syphilitic neuralgia may be due either to simple hyperæmia of the nerve-

tubes or to their degeneration, and in certain cases nothing pathological is found, the electrical reaction being in no way modified. Obolenski (*Berl. klin. Woch.*, Feb. 12, '94).

Account of 15 cases of a peripheral nervous affection localized in the area of distribution of the external cutaneous nerve, name of "external paræsthetic neuralgia" being applied to these cases. The chief symptoms are pain, paræsthesia, and anæsthesia of the external aspect of the thigh. It is found chiefly among males suffering from various disturbances of the circulation (hæmorrhoids and varicose veins) and who lead a sedentary life. Symptoms believed to be due to pressure upon the nerve where it passes by the antero-superior spine. Roth (*Le Bull. Méd.*, June 8, '95).

Treatment.—The first indication is removal of the cause, when such is discoverable and can be removed. General tonic and hygienic treatment is always advisable, as any improvement in vital tone and blood-quality gives measurable relief from idiopathic neuralgia. Removal from an unhealthy climate often gives relief. Iron, arsenic, strychnine, codliver-oil, and phosphorus singly or in combination are the tonics most used. Quinine, at one time much lauded as a specific for some forms of neuralgia, is apt to prove disappointing.

In anæmic neuralgia arsenic is the best remedy; in the gouty state, besides the ordinary remedies, colchicine in $\frac{1}{30}$ -grain doses and muriate of ammonia in 20-grain doses are particularly useful. Cagney (*Clin. Jour.*, Feb. 20, '95).

The systematic use of electricity, long continued, is one of the most valuable means at our disposal for the permanent relief of neuralgic pain, the galvanic current giving best results.

Neuralgia divided into two classes: peripheral and central. In peripheral neuralgia use of iodine, subcutaneous injections of carbolic acid, and salicylic

preparations recommended. Antipyrine may calm, but not cure. Narcotics should be avoided. Best treatment is electricity and cauterization. Neuralgias should be treated rapidly and palliative treatment not employed. Moritz Benedikt (Klin. Zeit. und Streitfragen, '92).

Literature of '96-'97-'98.

Electricity affords the best means of palliating, if not curing, trifacial neuralgia. A constant current of 35 to 50 milliamperes should be used, the positive electrode being applied to the seat of pain. This electrode should have an area of two hundred to two hundred and fifty square centimetres, the negative being about double the size, to be applied over the spinal column, and each sitting to last at least fifteen minutes, or it may exceed half an hour. The positive pole should be accurately molded to the face, exactly covering the painful area. Bergonié (Arch. d'Elect. Méd., Oct. 5, '97).

Of remedies for the relief of the paroxysms of pain the coal-tar derivatives stand first. Gelsemium also is a valuable antineuralgic agent, as are ether, valerian (these last two often in combination); aconite or its active principle, aconitia; cannabis Indica, and cimicifuga. Alcohol oftentimes affords relief, but it is a dangerous remedy and should be prescribed with caution. Nitroglycerin has been found useful in cases of facial neuralgia.

Hypnal regarded as superior to chloral in the treatment of neuralgic insomnia. Frenkel (Rev. Balear de Cien. Méd., Oct. 31, '91).

Favorable report on use of analgen after experience covering about 200 cases of neuralgia. A full dose, from 10 to 15 grains, is to be repeated in two or three hours. Foy (Med. Press, June 13, '94).

Neuralgic headache, affecting the trigeminal distribution, yields quickest to aconitine, pushed until the physiological effect be obtained. Hamilton ("Modern Treat. of Head.," '91).

Fifty-seven cases of neuralgia successfully treated by aconitine. No untoward symptoms were noted at any time, either loss of appetite, constipation, nausea, dryness of throat, or headache. J. Newton Hunsberger (Ther. Gaz., Aug. 15, '95).

When all other remedies fail morphia hypodermically may justifiably be used. Acupuncture, injection of water beneath the skin, and active counter-irritation may also be used with some hope of benefit. The actual cautery is quite efficacious in some instances. A strong galvanic current, sufficient to almost or quite blister the skin will frequently break up an attack completely.

A new method of treating facial neuralgia consists in giving an hypodermic injection of cocaine in the affected place, followed by strongest current of faradic electricity the patient can bear, one pole being placed at the foramen of exit and the other on the course of the nerve one-half inch distant. Fraenkel (Med. News, Mar. 15, '90).

Local application of chloroform recommended in neuralgia of every kind, even in sciatica; a case of the latter affection, previously obstinate, yielded to two applications of the remedy. Grellety (Bull. et Mém. de la Soc. de Thér., Feb. 22, '93).

Five hundred and eighty-five patients attacked by essential neuralgia personally treated, and 52 per cent. of cures, 43 per cent. of ameliorations, and 5 per cent. of failures obtained by means of hydrotherapy (wet compresses, vapor-baths, vapor-douches, cold affusions, wet cloths, rain-water, etc.). W. Winternitz (Inter. klin. Rund., Feb. 7, '92).

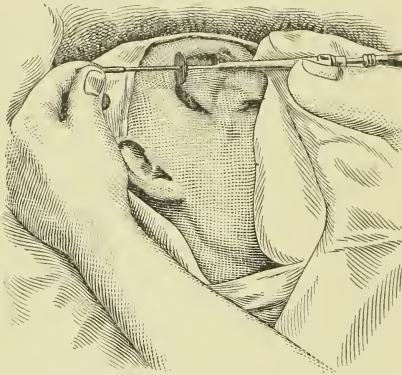
Literature of '96-'97-'98.

For neuralgia injections of following are recommended: Osmic acid, 1; distilled water, 6; glycerin, 4 (Schapiro); to be kept in a closed bottle. Of this $\frac{1}{10}$ grain of the drug is to be used.

The needle should be inserted perpendicularly and deep into the muscles or to the bone as near as is possible to the

most painful point, the overflow on the skin being prevented by a bit of cotton. When injections are made into the face, a smaller quantity should be used in order to avoid induration, which may be of a dark color. Erwin Franck (*Fortschritte der Med.*, Aug., '96).

In severe and obstinate cases the question of surgical interference may arise, the usual resources being nerve-stretching and excision of a portion of the nerve-trunk or of its ganglion. These procedures always give temporary relief or respite from pain for some months, but unless there has been total destruction of the affected sensory neurons, as



Formation of flaps in Krause's operation.

by removal of the ganglion, the pain is liable to return as the nerve-fibres regenerate.

[In dealing with neuralgia of the second division Horsley distinctly prefers (as a primary operation) the operation of Carnochan, as modified by Chavasse, which greatly resembles Wagner's operation. In this the eyelids are stitched together as a preliminary precaution. His incision is a semilunar one along the inferior orbital margin, with a vertical one placed at right angles to it over the infra-orbital foramen, and about three-quarters of an inch in length. The flaps thus marked out are raised from the bone, including even the periosteum. The orbital tissues are now freed from the bone; and emphasis is laid on the

fact that, if the orbital periosteum be maintained whole and unbroken, the orbital fat is not seen and does not protrude into the wound. The canal is laid open with a fine pair of bone-forceps, and, as a rule, the antrum remains intact. Should it be accidentally opened, the cavity is to be filled with powdered boric acid. No interference with the healing of the wound is to be expected. The nerve is freed as far as the foramen rotundum, and there divided. R. MATAS, Assoc. Ed., Annual, '93.]

Superior maxillary division of the fifth nerve removed by operation. Performed after Thiersch's method, which consists in freely exposing the infra-orbital at the foramen of exit. The nerve is seized with a small forceps obliquely to its length and is drawn out very slowly by turning the forceps around the nerve in a central as well as a peripheral direction, in such a manner that, as the operation goes on, the nerve winds itself around the forceps. The operator succeeds by this process in bringing out the peripheral branches of the nerve almost to its finest distribution, and the central trunk is also pulled off as far as the sphenoidal fissure. A slight facial palsy follows the removal of the second trigeminal nerve in this way, and is due to the simultaneous removal of anastomosing facial branches. James Israel (*Berliner klin. Woch.*, Jan. 20, '90).

Extirpation of the Gasserian ganglion is indicated in cases of neuralgia in which all the branches of the trigeminus are involved. In such cases, however, intracranial lesions are also present. When there are irradiations of pain, resection of the nerve at the most painful points will relieve the irradiation. Le Dentu (*Bull. Gcn. de Thér.*, Aug. 30, '95).

Removal of Gasserian ganglion recommended in obstinate cases of facial neuralgia. A pear-shaped flap of bone, together with the coverings of skin and muscle, the base of which is seated just above the zygomatic arch, is formed in the temporal region, the bone being divided by a circular saw, worked either by an electro-motor or by a dental engine, as shown in the illustration. This flap, still remaining attached at its base,

is turned down, and the exposed dura mater is carefully detached from the bone of the middle cranial fossa and elevated, together with the brain, by a broad retractor. Next the middle meningeal artery is ligatured and the dura mater carefully detached from the bone. In this manner the Gasserian ganglion is exposed and removed. It may be adherent to the meninges, and, if great care is not taken, they may be injured or the cavernous sinus opened. If the latter happen the hæmorrhage must be arrested by packing with gauze, and further operation desisted from. Comparison of cases operated on by Rose's method and those operated on by the method of Krause and Frank Hartley shows a mortality of 18 per cent. in the former and 9.8 in the latter. Curious functional disturbances may follow the operation. Fedor Krause (*Berliner klin. Woch.*, June 5, '95).

Literature of '96-'97-'98.

Thiersch's method of nerve evulsion performed on 26 patients, 52 nerves being removed for the relief of trifacial neuralgia in all but 1 case. Of the 26 patients, 17 are now free from pain, in 16 four years have elapsed since the operation. Three required further operation, and 3 out of the remaining 12 present a recurrence. Seven patients remain to-day free from pain: four years after operation. The extraction should be performed even more slowly than Thiersch recommended; twenty centimetres of nerve, including the finer twigs, may thus be removed. As a prophylactic measure, the seemingly healthy divisions of the nerve should also be removed, as the neuralgia rarely remains confined to one branch.

There is never any complaint of the resulting anæsthesia. The prophylactic operations may prevent the occurrence of a return of symptoms and of resort to the severer operations at the base of the skull. Angerer (*Verhand. der deut. Gesell. Chir.*, xxv Congress, '96).

Relapse of the neuralgia occurs much less frequently after destruction of the ganglion than after resection of the main branches. Hitherto the results of com-

plete extirpation have not, however, been superior to those of simple destruction of the ganglion. Of 95 recorded cases of operation 17 proved fatal, the mortality of the temporal method (Hartley-Krause and Doyen) having been about $12\frac{1}{2}$ per cent., and that of Rose's method about $20\frac{1}{2}$ per cent. There has been no difference in the rates of mortality attending complete and incomplete extirpation of the ganglion. Marchant and Herbert (*Rev. de Chir.*, Apr., '97).

In even quite severe cases the pains are liable to spontaneously subside in old age, or frequently after the climacteric in women.

Neuralgia of Special Branches.

NEURALGIA OF THE FIFTH PAIR.—

Neuralgia of the fifth pair of cranial nerves is also known as trifacial neuralgia, facial neuralgia, *tic douloureux*, etc.

Neuralgia of the fifth pair is more frequent than all other forms of neuralgia combined, and is, from a clinical standpoint, the most important of the forms of neuralgia with which the physician has to deal, this nerve seeming peculiarly susceptible to functional and organic disorders as a consequence of the complexity and highly differentiated character of its structure and connections.

All three of the branches are seldom affected simultaneously. The ophthalmic branch is that most often involved, giving rise to neuralgic pain in eye and brow ("brow-ague") with an especially painful point at the supra-orbital notch. In some cases the pain is especially intense in the eyeball. When the infra-orbital branch is involved there is the usual pain in the area of distribution of the nerve, and a marked tender point at infra-orbital foramen. A toothache-like pain in upper teeth is common. In neuralgia of the inferior dental branch the pain is often diffuse, extending from temporal region over the side of the face to the chin, with pain in lower teeth and

side of the tongue, the last mentioned being, in some cases, the situation of greatest intensity. In severe forms of pain involving any branch of the fifth nerve the pain may in lesser degree extend to the other branches. In all forms of facial neuralgia trophic disorders, in particular herpes, may occur. When the pain in facial neuralgia is very intense and markedly paroxysmal, with reflex facial muscular spasm accompanying, we have the form known as "tic douloureux": the most distressing and intractable form of nerve-pain. The general symptomatology and causation, as well as therapeutic indications of neuralgia in general apply to the facial form.

Literature of '96-'97-'98-'99.

Neuralgias of the fifth nerve differ in history, course, and treatment from migraine. True cases occur in groups, but this is due to season of the year. Occasionally it begins in youth and continues at intervals for years. The pain is deep, sometimes over the entire area of the supra-orbital nerve; sometimes most at one spot, as on the brow; occasionally associated with pains in other parts of the head. Usually there is an attack in the morning, a lighter one in the afternoon, perhaps a slight one at night. Some persons have 2 attacks every year, spring and autumn. Sometimes there is a family history of this or migrainous affection. J. J. Putnam (Med. Rec., May 9, '99).

Treatment.—In treatment, improvement in general health is first to be sought.

For the relief of the acute pain opium, of course, is most reliable, but it should not be employed until aconite, coal-tar remedies, and other analgesics have been given a trial. Galvanic electricity seems especially valuable. The cataphoric administration of cocaine, chloroform, aconite, and other similar drugs gives in many cases complete and entire re-

lief for many hours. The continued hypodermic use of strychnine at the seat of the pain has given excellent results in preventing the return of the paroxysms.

A certain number of cases of tic douloureux believed to be caused by cicatrization of the peripheral portion of the nerve. These cicatricial lesions are produced chiefly by alveolar dental periostitis, and also by the periostitis caused by eruption of the wisdom teeth. The first *desideratum* is, therefore, to cause the disappearance of the cicatrices by scraping the bone and freeing the mucous membrane of the gums. Jarre (Med. Press and Circ., Sept. 13, '93).

Literature of '96-'97-'98-'99.

In tic douloureux injections of strychnine are valuable made once a day, the dose being gradually increased from $\frac{1}{30}$ to $\frac{1}{5}$ or $\frac{1}{4}$ grain; ten to twenty days are required to reach this maximum. As adjuvants to the injections potassium iodide and iron, rest in bed, light diet, and diluents are to be used. Dana (Boston Med. and Surg. Jour., July 2, '96).

Severe case of tic douloureux successfully treated with nitroglycerin. Tablets of $\frac{1}{100}$ grain were prescribed, at first thrice daily, gradually increased until the patient was taking seven or eight tablets daily, and, if necessary, one every hour. The face was also treated with a mild galvanic current, and she was given a laxative tonic. She began to improve after the second week, and the improvement steadily continued.

The dose of nitroglycerin should be increased until the physiological effects are produced, even if enormous quantities must be administered. Krauss (Buffalo Med. Jour., Oct., '97).

Treatment of neuralgia of the fifth nerve is quinine in large dose four hours before attack, arsenic, and attention to nasal passages. J. J. Putnam (Med. Rec., May 9, '99).

CERVICO-OCCIPITAL NEURALGIA is located in first four pairs of spinal nerves, posterior branches, and is most often a

result of exposure to cold or of disease of the adjacent vertebræ.

CERVICO-BRACHIAL NEURALGIA involves the sensory nerve-fibres of the brachial plexus, its common causes being cold, rheumatic disorders, or local injury. The pain is situated in the shoulder, and may extend down the arm along the course of the ulnar nerve.

Literature of '96-'97-'98.

Brachial neuralgia is a rare disease, and is frequently only a symptom of an organic or functional disorder of the central nervous system or of genuine neuritis. It most often consists in pain in the arm of ill-defined character and localization of a pain of psychical or neurasthenic origin, rather than that of a genuine neuralgia. Oppenheim (Berlin klin. Woch., June 27, '98).

INTERCOSTAL NEURALGIA, involving one or more of the intercostal nerves, is, after facial neuralgia, the most frequent and important form. It is seen more often in women than in men, giving rise, when located in nerves distributed to the mammary glands, to the so-called "mammary neuralgia." The comparatively slight and fugitive pains of pleurodynia unassociated with tender points are to be regarded as neuralgic in character. Herpes zoster is seen with especial frequency in intercostal nerve-areas (see **HERPES ZOSTER**, volume iii).

LUMBAR NEURALGIA, involving the branches of the lumbar plexus, presents few symptoms not seen in other forms of neuralgia. The condition of "irritable testis," with pain and syncopal attacks, is probably based upon a neuralgia of the nerves of the part.

COCYGOGINIA is a neuralgia of the coccygeal plexus, most frequent, obstinate, and intractable in women, and often calling for surgical interference.

NEURALGIA OF THE SCIATIC NERVE usually assumes the form of "sciatica"

(described under **PERIPHERAL NERVES, DISEASES OF**).

NEURALGIAS OF THE NERVES OF THE LEGS, described as crural, plantar, metatarsal, etc., present the usual features of neuralgia in general and need not here be elaborated.

Treatment.—The treatment of the intercostal form of neuralgia, as of the two preceding varieties, is that of neuralgia in general. Especially good results are obtained from counter-irritation, preferably the actual cautery.

Treatment of intercostal neuralgia should be either palliative or radical. Among palliative measures may be included mustard poultices, chloroform liniments, blisters quickly removed, dry cupping, or even the actual cautery. Radical treatment should be directed to the cause, since intercostal neuralgia is not a disease, but a symptom. Frank Billings (Chicago Med. Recorder, Sept., '95).

Migraine.

Definition.—A form of severe paroxysmal headache often accompanied by nausea and vomiting. Called also "hemispheres," "neuralgic headache," "sick headache," etc.

Symptoms.—Premonitory symptoms extending over a few hours to a day or two are not uncommon, these being mental hebetude, somnolence, or despondency, with vague uneasiness or ill-defined discomfort. Abnormal visual phenomena are also frequently seen prior to onset of the attack, these consisting of visual hallucinations, pupillary abnormalities, hemianopsia, and indistinctness of sight. Disturbances of other sense-mechanisms are more rare, although sometimes shown, such as anæsthetic areas about the head and face, aphonia, and transient mental disorder or confusion of ideas. Following these prodromal symptoms more or less closely,

or accompanying them in quickly-developing cases, we have the characteristic headache, at first unilateral, located in the temple, eye, or occiput, but spreading as it increases in intensity until it involves all of one side of head, or in some cases both sides. The pain is intense, throbbing, and is increased by movement, noises, light, and any worry or emotional strain. Nausea is usual and vomiting frequent, becoming, in the so-called bilious headache, very distressing. This vomiting in occasional cases gives relief, its occurrence marking the end of the attack; but the usual rule is that the pain is increased and rendered more unbearable by the vomiting. The face is sometimes flushed, sometimes pale; the pulse is slow and the arteries throb and have a sclerotic feel to the touch. There is great prostration and physical weakness, and complete loss of appetite. Temperature abnormalities are sometimes present, but are neither constant nor characteristic. The urine is sometimes abundant, sometimes almost suppressed. Constipation at the beginning of the attack is the rule. The duration of the paroxysm is variable, from a few hours to several days. Twenty-four to thirty-six hours of suffering is frequent, and in the severer forms the patient may be kept in bed three or four days. The attacks recur for years, or, in rare cases, through life. In old age they usually cease; and in many women there is complete cessation after the climacteric. The seizures in women are apt to occur at or near the menstrual periods. The attacks subside slowly, as a rule. With the beginning diminution of the pain the patient falls asleep and awakes some hours later free from the pain and often feeling better than before the attack.

Close connection between migraine and other neuroses pointed out. The

cortical disturbance which produces migraine may extend, and so produce other neuroses; thus hemianæsthesia, functional motor paralysis, aphasia, or alexia may result. In two cases mental disturbance was noted, in one hallucinations and loss of memory occurred immediately after an unusually severe attack of migraine, and were followed by a condition of stupor lasting thirty-six hours; gradual recovery took place. In the other, each attack was associated with maniacal symptoms lasting about an hour and a half, the patient having no remembrance of the attack when it was over. In both these cases there was typical migraine with telchopsia. Migraine is not to be regarded as a special form of epilepsy or hysteria, but either of these may succeed it. Krafft-Ebing (*Neurol. Centralb.*, Nov., '95).

Diagnosis.—The diagnosis of migraine is without especial difficulty, the presence of the characteristic headache and other clinical symptoms above mentioned being all sufficient. It is to be remembered that neuralgia and other forms of headache may occur in a patient who suffers from migraine.

Literature of '96-'97-'98.

In paroxysmal hyperacidity in children, unless the vomit is submitted to a chemical examination, the disease may easily be confounded with migraine or recurrent catarrh of the stomach. It may be observed, however, that migraine usually occurs at a later period of life than paroxysmal hyperacidity and that its onset is preceded by ocular phenomena which are absent in the latter disorder. The headache also is never relieved by drinking tepid water nor is severe epigastric pain an ordinary symptom of the complaint. Lastly, the ejecta never contain any excess of free hydrochloric acid. W. Soltau Fenwick (*Lancet*, Jan. 8, '98).

Prognosis.—Even frequent recurrence of migraine seems to have little unfavorable effect upon the general health, and life is not endangered nor probably

shortened by the affection. The disease, as above said, often spontaneously subsides after middle life. Many cases are improved by treatment, in that the attacks are diminished in number and in severity, and the individual paroxysms may be aborted or quickly relieved.

A complete cure—*i.e.*, to the extent of entirely preventing recurrence of the headaches—is, however, rarely obtained by any mode of treatment yet devised. The outlook is more favorable where there is obvious, but removable, impairment of health or some removable source of reflex irritation, such as eye-strain. The most unfavorable and intractable cases are those in which strong hereditary predisposition exists.

Etiology and Pathology.—Regarding the pathology of the affection there are some differences of opinion. There are no discoverable anatomical lesions. The most tenable theory is that of Liveing: that the affection is a neurosis in whose course there occur periodical sensory discharges analogous to the motor discharges of epilepsy. It is, however, by some regarded as a neuralgic affection of the ophthalmic division of the fifth nerve, and others look upon it as a “vasomotor neurosis.”

Essential condition in migraine is an alteration in the blood-supply of more or less of the cortex of one cerebral hemisphere, and the cerebral symptoms—such as hemianopsia, scotoma, etc., which often complicate migraine—are explained from the same cause. Among the etiological factors in migraine is noted especially a change in the quality of the blood. Neftel (*Archiv f. Psych. u. Nerven*., B. 21, p. 117, '89).

Hereditary predisposition is the most frequent and important etiological factor. Women of neurotic families are the greatest sufferers from the disease, although the affection is by no means uncommon in men. It is more common

among the educated upper classes than among the laboring class. It generally makes its first appearance at or near puberty; rarely, if ever, after middle life. Overwork at school or in business, worry, lack of open-air exercise, wasting, and diathetic diseases predispose to the affection, and reflex causes are often traceable, especially disorders of the female generative organs and refractive errors and ocular muscular insufficiencies. The exciting causes immediately preceding the paroxysm are manifold and various, it being also remembered that even when there is no exciting cause the rhythmical recurrence of the seizures will not be broken. As a rule, when the usual time between attacks has nearly or quite passed, any suddenly produced nervous impression will precipitate the attack.

The common exciting causes are: indiscretions in eating, excitement, fatigue, emotional outbursts (anger, grief, etc.), loud disturbing noises, visual impressions of moving objects (as of railway-trains, passing crowds, a rapidly moving field in microscopical work, riding backward), etc. Toothache from carious teeth and the presence in children of adenoid growths in the nasopharynx act also as immediate causes, as do gastro-intestinal disorders and leucomaine or ptomaine poisoning.

Migraine believed to be due to defective or insufficient excretion, partly of the liver, but mainly of the kidneys. The severity of the headache is directly proportionate to the acidity of the gastric fluids, and this can be greatly lessened by the free use of alkaline draughts. Treatment may be begun twelve or twenty-four hours in advance of the time the migraine is expected to begin, with a view to abort it. Alexander Wallace (*Lancet*, Jan. 14, '93).

Migraine attributed to two principal causes: (1) poisoning of gastric origin;

(2) cerebral fatigue. W. Hind (Provincial Med. Jour., Oct. 2, '94).

Principal causes of migraine are arthritis, the nervous diathesis, chlorosis, anæmia, and all conditions which weaken the resistance of the nervous system. Clauss (Jour. d'Accouche., Sept. 2, '94).

Literature of '96-'97-'98.

Migraine regarded as a toxæmic condition, the toxins, (probably albumoses) being absorbed from the gastro-intestinal canal. In seven patients the contents of the stomach were examined during the paroxysm, and in these there was evidence of complete arrest of gastric digestion. C. E. Herter (Jour. of Nerv. and Mental Dis., Jan., '97).

The occurrence in migraine of almost constant vomiting, frequent attacks of diarrhœa, and polyuria or increase in other secretions is proof that many cases of this affection depend upon intoxication. It is also probable that many attacks are due to the uric-acid diathesis. W. Stekel (Wiener med. Woch., Nov. 13, '97).

Treatment.—When, as is often the case, the patient is aware of the causes which produce the paroxysms the first requisite is a rigid avoidance of these causes. In this way the number of attacks may be materially diminished, although no amount of care will altogether prevent occasional recurrences. In children the first attack of hemi-crania should suggest a careful search for ocular insufficiencies or other possible reflex cause, and in all children of neurotic families having a predisposition to migraine especial hygienic precautions, as to avoidance of eating excessively, long hours of study, etc., should be observed.

When an attack supervenes the first requisite is absolute mental and physical rest and quiet, and this in mild cases may be sufficient to give relief within an hour or two. Usually other remedies are required.

Of drugs the most valuable are the coal-tar derivatives, singly or in combination with one another, and caffeine, sodium salicylate, guarana, ammonium chloride, bromides, chloral, cannabis Indica, and a long list of similar drugs. Antipyrine is sometimes quite effective. Acetanilid (antifebrin) has also been recommended.

Good results in the treatment of migraine obtained by $\frac{1}{20}$ grain of bromide of gold well diluted in water, given during the attack and repeated in an hour if necessary. Given between the attacks in doses of $\frac{1}{20}$ grain twice a day it acts as a prophylactic. Goubert (Ann. Thér. Médico-chir., June, '89).

In migraine cannabis Indica has rendered decided benefit in doses of $\frac{1}{4}$ grain of the extract. C. W. Suckling (Brit. Med. Jour., July 14, '91).

Canabis Indica is the best drug for the treatment of migraine; it usually not only acts as a calmative, but also as a curative agent. It should be given in sufficiently large doses. J. B. Mattison (N. Y. Med. Jour., Oct. 10, '91).

Menthol, in certain forms of neuralgic headache, has been effective in 10-grain doses, administered in hot whisky. J. J. Berry (Med. Mirror, May, '91).

Literature of '96-'97-'98.

In migraine bromides are given as follows: Starting with 30 grains a day for a week, the daily dose is raised by 15 grains every week, and after a time reduced progressively by the same amount, when it is again increased. Up to $1\frac{3}{4}$ drachms a day may be tolerated. By this means migraine of years' standing may be completely cured, but the treatment must be absolutely continuous, and may extend over more than a year. As an aid to treatment alcohol is forbidden. Gilles de la Tourette (Sem. Méd., June 24, '96).

In angiospastic migraine, $4\frac{1}{2}$ grains of methyl-blue, given in 3 doses, 2 hours apart, at the onset of the attack, may prevent its oncoming. If the dose is not given until the height of the attack, the patient may vomit and no benefit ac-

erue. Leroy (Berl. klin. Woch., No. 45, '96).

Very remarkable results were obtained in migraine with methyl-blue. However, there is individual predisposition or idiosyncrasy on the part of some patients to this drug; and, although, in the majority of cases, a daily dose of 15 grains can be readily borne, there are cases where serious, though not dangerous, symptoms are produced. The mild symptoms are: weakness in the limbs, paræsthesia, mental prepossession, giddiness, and desire to vomit. Large doses produce more marked symptoms of irritation, but so far have given rise to none that were dangerous. The drug is harmless in small doses, and effectual, while it is not dangerous in large doses. Schindler (Berl. klin. Woch., No. 46, '96).

When other remedies fail, hypodermic injections of morphine will usually give prompt relief. Inhalations of chloroform may also be resorted to, but are not to be used when other means of relief will suffice. The danger of the establishment of a drug habit should be constantly borne in mind, and the patient be not permitted to use opium, chloroform, or similar remedies indiscriminately nor on his own responsibility. It is also noteworthy that each case must be treated individually, and that remedy employed which experience shows to give in the particular case most relief with least subsequent harm. What will entirely and quickly cure one patient may produce absolutely no effect upon the next case; and after long use any drug is liable to partially lose its effect.

Other measures than the administration of medicines also give frequent and marked relief. Of these the galvanic current to the temples and back of neck ranks first, often breaking up an attack, and when used continuously for some weeks diminishing to a great degree the tendency to migrainous attacks. Counter-irritation to the head by the actual

cautery, mustard plasters, menthol, etc., is frequently helpful, as is also a hot foot-bath. Hypnotic suggestion is used by some, but is a dangerous remedy of very questionable value.

Literature of '96-'97-'98.

As an initial step in treatment of migraine, washing out of the stomach with water at a temperature of not less than 105° F. recommended. The sooner that this is done after the beginning of the attack, the better are the results. After lavage, a rapidly acting aperient, such as a teaspoonful or dessertspoonful of Carlsbad salts, is given. This should be aided by a soap-and-water enema. Should the headache not be removed by these means, phenacetin (10 grains) and antifebrin (5 grains) may be given. Black coffee without sugar and citrate of caffeine are also efficacious. In the intervals between the attacks milk should constitute the proteid food of at least one meal a day, and red meat should not be allowed more than once a day. Bicycling and horseback-riding are the best forms of exercise. C. E. Herter (Jour. of Nerv. and Mental Dis., Jan., '97).

During the intervals between the paroxysms hygienic measures directed toward the improvement of the general health are indicated. The long-continued use of cannabis Indica in moderate doses, or of nitroglycerin and the bromides seemingly exerts a favorable influence over the course of this disease, and in at least some cases gives great relief by reducing the number and severity of the attacks.

Literature of '96-'97-'98.

One of the most powerful agents for the prevention of sick and nervous headaches is water. The result of the drinking of large quantities of water daily in cases of life-long addiction to the headache habit is little short of marvelous.

The most common contra-indication to water given by the stomach is motor

inefficiency of that organ with or without dilatation. Editorial (Cleveland Jour. of Med., Oct., '98).

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NEURASTHENIA. — Gr. *νεῖπον*, nerve; *ἀσθένεια*, weakness.

Definition.—Functional exhaustion or debility of the tissues, especially those of the nervous system, due primarily to impaired metabolism and secondarily to autointoxication.

Symptoms.—The most prominent symptom of neurasthenia is fatigue, often varying in degree with the duration of the case, but usually excessive and persistent. The patient complains of feeling "very tired" and of being unable to do mental labor, the least concentration being followed by vertigo, headache, etc.

Literature of '96-'97-'98.

It is characteristic of this sense of fatigue that it is in simple and typical cases always relieved or lessened by rest, and always brought on, if absent, or made worse, if present, by exertion. This readiness of fatigue is the primary and fundamental symptom of neurasthenia. When the fatigue sensations become exaggerated, they become painful, and are then described as aches. Der-cum (Alienist and Neurol., Oct., '97).

The headache varies in intensity from a sensation of heaviness on the top of the head, or fullness, to a feeling compared by some patients to that which an iron band tightly constricting the head might produce. This is especially marked after intellectual labor, and often disappears after the latter ceases.

The appearance of the patient does not always denote the existence of the neurasthenic state; indeed, his general mien may suggest perfect health. In the majority of cases, however, there is

pallor and an unmistakable appearance of weariness. Loss of weight and anæmia are often present, and occasionally the physical debility is so great as to keep the patient in bed.

Amnesia, general and verbal, weakness and indistinctness of speech, irritability, fretfulness, and hypochondria, sometimes reaching to melancholia and suicidal tendencies, are sometimes witnessed. Mental aberration is suggested by many petty acts which the patient in his normal state would not have perpetrated. Indeed, he may become tyrannical, envious, jealous, and even cruel. Curious perversions of mental activity are witnessed, mental pictures and various thoughts succeeding one another with rapidity, while a name, a sentence, a time, etc., will for hours and even days recur constantly to the patient's mind.

Rare form of sexual neurasthenia with fixed ideas. Four cases reported: two men and two women. These patients were of degenerated heredity, having always present abnormal excitability of the genital organs and abnormal erotic ideas, and an obscene mental condition provoked by the sight of certain objects. Krafft-Ebing (Inter. klin. Rund., Mar. 13, '92).

Again, he may constantly be dreading falls, especially when near an open space, such as the top of a staircase, or experience a sense of suffocation upon the least excitement or unusual incident of every-day life. The sudden appearance of a stranger or any unusual incident of daily life may thus excite intense fear and give rise to dangerous manifestations, especially when an organic cardiac disorder is present.

Pain along the spine accompanied by localized spinal tenderness is often complained of. Lumbago and various muscular pains suggesting rheumatism are frequent. In cases in which spinal

symptoms predominate there is also marked muscular weakness,—a symptom to which Charcot attached much importance and frequently associated with tremor,—and sometimes disturbances of co-ordination, the presence of locomotor ataxia being suggested. General paresis may also be simulated; indeed, when there is a history of syphilis the differential diagnosis sometimes becomes difficult.

Syphilitic neurasthenia occurs very frequently in the course of syphilis, first showing itself in the secondary period, toward the fourth or fifth month, especially in women.

Neurasthenia appearing at the tertiary period is less common, sometimes accompanying the tertiary symptoms and sometimes appearing alone. The abortive form is the most painful, the most persistent, and the most often unrecognized. The principal features of the headache, which is the only symptom, are its long duration and the cerebral disturbance, which is greater than the real pain. It is diurnal, and thus allows the patient to sleep calmly at night. The complete form of tertiary neurasthenia is a reproduction of the picture of irritable debility of Beard. Fournier (*Gaz. des Hôp.*, Sept. 5, '93).

Hyperæsthesia of certain regions of the skin (Valleix's points) is sometimes noticed. Formications, evanescent sensations of localized heat and cold, are occasionally complained of, though these sensations may be general, as are also profuse sweating and the flushes of heat so frequently met with during the menopause.

Neurasthenia may sometimes display itself by a single peripheral or visceral symptom, whence the name, "topoalgia" given by Paul Blocq to these localized neurasthenic pains. They are often persistent, especially when located in the stomach or heart. These cases are designated by the term "local neurasthenia." Huchard (*Archives Gén. de Méd.*, Dec., '92).

Rumination may be a symptom of neurasthenia, explained by an exaggerated irritability of the gastric mucous membrane as regards certain mechanical or chemical stimulants. Nacke (*Neurol. Centralbl.*, Jan. 1, '93).

Vertigo is often complained of; in some cases it is almost continuous and characterized by exacerbations, during which the patient may fall and suffer injury. Hysterical manifestations are frequent, especially in women, though true hysteria be absent.

Irregular action of the heart, palpitation, is usually noted, the pulse sometimes being very rapid; apprehension, pain, and general distress in the cardiac region often result, increased by the least excitement, anxiety, or fit of temper. Throbbing of the arteries, including the peripheral arterioles and even at times the capillaries of the nails, may be witnessed, the veins, at times, taking part in the manifestation. Still, the extremities may be quite cold, the patient requiring heavy clothing to feel at all comfortable.

Literature of '96-'97-'98.

In examining a large number of patients suffering from neurasthenia it was noticed that the customary increase in the rapidity of the pulse that follows the movements of the body in these cases does not occur if the patients bend far forward. After continuing its previous rhythm for from 4 to 15 beats, there is a sudden retardation of the pulse, which continues for about 16 beats. After this, the pulse gradually reaches its former rapidity. Ortner also pointed out that the same result ensues if the patients bend their heads backward. This phenomenon is explained through the venous congestion of the vagus centre, giving rise to slight irritation of that centre. S. Erben (*Wiener klin. Woch.*, June 16, '98).

Fine muscular tremors are often observed, especially of the orbicularis oris

and the lingual muscles. Short spasmodic contractions of isolated groups of muscular fibres and aimless movements of the extremities that suggest, when facial muscles are involved, chorea. The tendon-reflexes are increased in the majority of cases.

Vision is often impaired, symptoms suggesting astigmatism following any prolonged use of the eyes. The pupils sometimes appear unusually large and and often unequal, while the accommodation seems defective. Unilateral ptosis is often observed. The eyes feel weary and heavy, and letters become blurred; flashes and pain are experienced in most cases after reading even a very short time—a few minutes.

In neurasthenia and hysteria the fundus of the eye is usually normal, but the field of vision usually shows a concentric limitation in both affections, which is considered precisely similar to that found in beginning atrophy of the nerves. In such cases the calibre of the arteries is of great value in diagnosis, as they are much smaller in beginning atrophy. Bernhardt (*Corres. f. Schweizer Aerzte*, Sept. 1, '90).

In neurasthenia there is a greater tendency of the eye to roll up when the lids are closed than happens normally. This is probably a manifestation of muscular weakness. Wolffberg (*Zehender's klin. Monats. f. Augenh.*, Apr., '94).

The urine is occasionally increased in quantity, but this is by no means as important a sign as some writers would have it. "Lithæmic neurasthenia" is a term applied to a form in which, besides the other symptoms enumerated, manifestations of lithæmia are marked. Phosphaturia, oxaluria, and glycosuria are frequently noted.

Literature of '96-'97-'98.

Series of non-traumatic cases of hysteria, hypochondria, and neurasthenia. They showed alimentary glycosuria in

14.4 per cent., as against 32.6 per cent. in traumatic neuroses, which seems to indicate that the latter occupies a position somewhat apart from other functional nervous diseases. Studies of this nature are especially desirable in neurasthenia. M. Arndt (*Berl. klin. Woch.*, Dec. 5, '98).

Sexual impotence is more or less marked and in some cases total. Seminal emissions at night and during defecation and micturition may be frequent, and depression after coitus is usually complained of. The testicles or ovaries may be extremely sensitive to pressure, a dull, heavy pain, quite persistent at times, being occasionally experienced.

Digestion is enfeebled and delayed and is associated with atonic constipation, and gastralgia is sometimes complained of. Diarrhœa, however, is noticed in a small proportion of cases.

Literature of '96-'97-'98.

In many cases witnessed hunger accompanied the attacks. Assuming that they were due to exhaustion from lack of food, combined with autointoxication from food in the intestines, which the neurasthenic stomach had hastily passed along in a more or less undigested condition, it was found that they could be cured by having the patient eat something, and prevented altogether by small, frequent meals. T. Benda (*Deut. med. Woch.*, Mar. 31, '98).

Tinnitus aurium, hyperacousis, and loss of taste also occasionally attend the more prominent symptoms. Undue redness of the ears and conjunctiva are frequently observed.

Diagnosis.—Various neuroses and psychoses may readily be taken for neurasthenia when the symptoms of the latter are few and indefinite, but this is rare, and the characteristic fatigue supplemented by the main symptoms that typify the affection usually render a diagnosis easy.

HYSTERIA may be confounded with neurasthenia, but both affections may exist simultaneously in some cases. The absence of crises, contractures, among other hysterical stigmata serves to eliminate the disease as the primary one.

Attention called to the various motor disturbances in neurasthenia that may be confounded with hysteria. Tremor, the most important, exists in two-thirds of all cases, and is identical with that of exophthalmic goitre. Other motor troubles exist, though less frequently: cramps, without apparent cause; muscular weakness; rhythmical spasms of the neck, tongue, and diaphragm, and constriction of the œsophagus. Abasia may also be a symptom of neurasthenia, without any hysterical signs. Pitres (*La Sem. Méd.*, Oct. 5, '92).

Literature of '96-'97-'98.

Severe (grave) hysteria without stigmata is very common; again, hysterical neurasthenia is one of the commonest varieties of this disease, and includes a very large part of the cases that ordinarily go under the name of neurasthenia. The recognition of this is very important because of the bearing which it has upon prognosis and treatment.

While hysterical neurasthenia may be called a pseudoneurasthenia, it would be very wrong to view as hysteria all pseudoneurasthenic cases. As classification the following are suggested as different types of pseudoneurasthenia: 1. Habit-neuroses, in which the symptoms mostly represent the persistence of manifestation of previous disease long since subsided. 2. Neuroses from the pure auto-suggestion; this would include certain types of phoboneuroses. 3. Intoxications, as from gout, uræmia, improper metabolism, etc. 4. Hysterical neurasthenia. Morton Prince (*Boston Med. and Surg. Jour.*, Dec. 29, '98).

LOCOMOTOR ATAXIA.—In neurasthenia reflex action is generally increased, while in the majority of organic affections of the nervous system, including tabes, they are diminished.

GENERAL PARESIS.—In this disease there is reduction of mental activity, while in neurasthenia the intellect is not necessarily impaired and is overactive in many cases. Mental labor is practically impossible, owing to the subsequent untoward effects. When a history of syphilis is present, however, symptoms of general paresis may supervene in addition to those typifying neurasthenia. This is particularly to be suspected when articulation is impaired or when the formation of sentences in writing becomes unusually difficult.

EXOPHTHALMIC GOITRE may also be confounded with neurasthenia, but only when there is no exophthalmos. The enlargement of the thyroid becomes the only reliable distinguishing feature, the rapid pulse, agitation, tremor, etc., being all present in neurasthenia.

Etiology.—To hereditary influence is attributed the majority of cases of neurasthenia, but a more correct interpretation of the facts would probably only ascribe to heredity a predisposing influence. The disease would thus only appear on condition that factors capable of starting it prevail during the exposed individual's life. Predisposition through parental neuroses, psychoses, excesses of all kinds, particularly in sexual relations, lowers the resistance of the organism as a living entity (not only of the nervous system), and pathogenic factors find a fruitful field which, had not inherited depravity prevailed, would have proved sterile. Gout, rheumatism, syphilis, and tuberculosis may also act as predisposing conditions in the offspring.

Individuals so predisposed represent by far the majority of cases witnessed. There is another class, however, in which the ever-increasing responsibilities attending modern methods of living, unrestrained extravagance, desire to

promptly acquire wealth, and the worry attending the responsibilities incurred, undermines the vital powers of the organism, and do for it what predisposition, heredity, has procured for the class first considered. If the latter are never exposed, neurasthenic symptoms never develop; if the victim of worryment can so change his occupation and his mode of living before the inroad of the malady is marked, a prompt return to health usually results. In both classes the exciting conditions are similar; and sexual indiscretion, continued worry and overwork, shock accompanying injury, exposure, indiscretions in diet, improperly selected or insufficient food, and many diseases, particularly influenza, syphilis, typhoid fever, and such disorders as alcoholism, morphinism, cocaineomania, etc., will act as primary causative factors of the typical form.

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Heredity is one of the most important causes of neurasthenia. Among acquired causes, the worry attending business affairs, the sequelæ of infectious diseases, especially influenza, are regarded as peculiar factors. Influenza is especially common as a forerunner of neurasthenia, occurring among physicians. Phillip Zenner (*Jour. Amer. Med. Assoc.*, May 21, '98).

In women, excessive fecundity, dysmenorrhœa, and the menopause are thought to exercise a marked exciting influence.

Literature of '96-'97-'98.

It is true that puberty, adolescence, the puerperium, menstruation, and the menopause are often closely related to the outbreak or to the exacerbation of many nervous and mental disorders, but the pelvic organs themselves play but a small rôle in these physiological commotions. They have to do with the whole organism of woman. Pelvic diseases in

woman attended by exhausting pain may give rise to neurasthenic and hysterical states, but the influence of exhausting pain in these organs is no greater than similar exhausting pain elsewhere in the body. Disorders of the female organs which affect the nutrition of the nervous system, such as excessive hæmorrhage or suppurative processes, may also be important factors in inducing functional neurosis, though disordered blood-states brought about by pelvic disease are very infrequent as compared with disordered blood-states dependent upon disease elsewhere. Frederick Peterson (*Anrals of Gyn. and Ped.*, Aug., '98).

Of all these causes, those connected with the male sexual organ have been credited with the most active etiological rôle, especially localized disorders, prostatitis, posterior urethritis, seminal vesiculitis, etc., and general disorders and habits, such as gonorrhœa and masturbation.

In neurasthenia involving the genito-urinary organs there is nothing organically wrong, although the finger in the rectum usually discloses a very sensitive condition of the prostatic region. In many of the cases the commencement of trouble is coincident with a preceding gonorrhœa. Guyon (*Ann. des Mal. des Organes Genito-urin.*, Sept., '93).

Literature of '96-'97-'98.

1. Neurasthenia proper can always be traced to excessive masturbation, unnatural sexual intercourse, etc. 2. Anxiety neurasthenia—distinguished by dread, restlessness, agoraphobia, vertigo in walking, sleeplessness, etc.—can also invariably be traced to sexual influences in the nature of unsatisfied impulses, *coitus interruptus*, abstinence with inflamed desires, etc. The physician is urged to assume an abnormal sexual life as his guiding star in the etiology of neurasthenia, as this alone will help him to treat it rationally, after winning his patient's confidence. Sigmund Freud (*Wien. klin. Woch.*, Nos. 2, 4, 5, and 7, '98).

Many functional derangements of the genito-urinary system, which have been called purely nervous or symptoms of neurasthenia, have as their pathological and anatomical basis a chronic or other form of prostatitis, and the so-called neurasthenia disappears as soon as this pathological condition has been cured. If these cases were only recognized early and treated properly, there would be a great diminution in the number of neurasthenic patients. A greater decrease, however, would follow the stamping out of gonorrhœa and the education of the public in the physiology of the sexual organs. Hottinger (*Corresp. f. Schweizer Aerzte*, No. 6, '97).

In most cases the active exercise of the sexual function is affected. The lesion, therefore, is to be looked for in or about the seminal vesicles and their ejaculatory ducts. In 19 of 20 consecutive cases a seminal vesiculitis, and not neurasthenia, will prove to be responsible for the symptoms. Eugène Fuller (*Med. Rec.*, Feb. 5, '98).

Attention called to prevalence of neurasthenia among those afflicted with a posterior urethritis either with or without a stricture of large calibre. Whether it is due to the worry of the local disease or from the poisons absorbed from the urethra itself is not clear, but probably both agents are at work. In syphilis neurasthenia is by no means uncommon, especially among those who have been saturated with drugs. Indeed, the supersaturation in many cases is the causal factor. Ravogli (*Jour. Amer. Med. Assoc.*, May 21, '98).

A simple laceration of the perineum may result in profound neurasthenia that will disappear when the perineum is restored. Impaired sexual gratification in both male and female may result from laceration of the perineum, and therefrom result unhappiness and neurasthenia. In some cases the nervous condition is the result of irritation from the vermiform appendix. Coccygodynia is a condition that may give rise to nervous symptoms on account of the intimate relationship that exists between the coccyx and the ganglion impar. The fear of bearing children with the result-

ing efforts to induce sterility, thought to be a frequent cause of neurasthenia. Joseph Eastman (*Med. News*, June 25, '98).

Syphilis is often incriminated, but it is probable that the injudicious use of mercury is mainly responsible for the many cases traced to this cause.

Cases in which heredity play the preliminary rôle usually appear during the transition between childhood and puberty—15 to 20 years, while those in which the acquired form obtains occur during the most active period of life: *i.e.*, between 30 to 45 years.

Pathology.—Neurasthenia was until recently solely attributed to exhaustion of the nerve-centres presiding over general nutrition, and particularly of the brain. Recent researches have tended to show, however, that the primary morbid changes exist in the organism at large. Indeed, actual loss of substance in the protoplasmic cells, especially of the nucleus, has been noted by Hodge. Impaired metabolism, with accumulation of waste-products, which in turn accumulate in the blood, gives rise to an autointoxication affecting especially the nervous system, and the functions over which the various systems preside are correspondingly impaired. This is further encouraged by the continued waste of energy from which the patient suffers if he persists in imposing even slight tasks upon his weakened organism. A vicious circle of pathogenic activity is thus formed.

The study of neurasthenia, or pathological fatigue, presents two essential conditions: 1. In normal fatigue, with the discharge of energy, the toxic products of exercise are always formed in nerve-and-muscle tissues. From this and other sources toxic elements may accumulate in the blood and tissues; in pathological fatigue these contribute to a local or general inanition and auto-

intoxication. Visible changes in nerve-cells, attending normal fatigue, go to support the inference of a molecular and chemical variation in pathological fatigue, manifested as a condition of exhausted or changed nutritional power. These changes bear a direct relation to the etiology and pathology of neurasthenia; and habit, diathesis, and idiosyncrasy have an important influence in causing "dispositions to repeat organic processes," both normal and abnormal. Physiological chemistry gives us some knowledge of the nature of autogenous toxic substances. 2. The study of the mental elements in normal and pathological fatigue shows that the mental symptoms furnish a ready index of the "fatigue": (a) the emotional tone is either one of well-being or ill-being, and the latter, with mental depression, indicates changes in the "sense of body," or common sensations due to deficient energy, inanition, and auto-intoxication; (b) special disorders of intellect and will are shown by a neurasthenic weakening of voluntary attention, or the mental power of inhibitory control, and of memory, etc. Cowles's Snattuck Lectures (Boston Med. and Surg. Jour., July 16 to Aug. 27, '91).

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The cause of the symptom-complex lies in deficient metabolism in the nervous system, slow blood-changes and venous stasis, brought about through insufficient respiration and weak heart-function. As a result there is an oxygen hunger of the tissues of the nervous system. Wiederhold (Therap. Monats., H. 10, S. 558, '97).

From the results of experiments it is believed that neurasthenia is associated with irregularities of oxidation of nitrogenous substances in the organism, and that it must therefore be classed with the other disorders due to, and associated with, disordered general metabolism. The chief cause is an intestinal auto-intoxication. Other predisposing causes of neurasthenia, such as mental strain, etc., which may have their influence in the causation of the intestinal disorder, are not excluded.

In all cases there is a considerable diminution in urea and increase in the uric acid. The relation of the total nitrogen to the quantity of urea indicates a marked decrease in the intensity of nitrogenous oxidation. The relation of the uric acid and disodium phosphate indicates an increased secretion of uric acid. In many cases the condition of the patient improves coincidently with the diminution or disappearance of the arthritic phenomena. The changes in the urine are those characteristic of intestinal putrefaction, thus suggesting that the cause of neurasthenia is in the intestinal tract. W. von Bechterew (Neurol. Centralb., Nov. 15, '98).

Prognosis.—If the organic changes outlined have not had time to so undermine the functions of the organs secondarily involved—especially the stomach and kidneys—as to compromise their physiological functions in nutrition and elimination of waste-products, the prognosis is usually favorable, provided proper prophylactic measures are strictly enforced, in conjunction with judicious treatment.

The occurrence of symptoms recalling locomotor ataxia or general paresis and impairment of articulation, though alarming, do not necessarily indicate a dangerous condition. Indeed, unless of too prolonged standing, they are sometimes the first to yield to appropriate measures.

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Study of arterial tension in neurasthenia by means of the sphygmograph, showing that neurasthenic patients may be divided into three classes: (1) those in whom the vascular tension is nearly or quite normal and who quickly recover; (2) those who show a decided loss of vascular tone and who, after a course of treatment, regain a normal tension, and who usually recover in a longer or shorter time; (3) those in whom the vascular tone is very much below normal, and in whom under treatment it

varies, but does not make any substantial gain. These cases do not improve much, and whatever is gained is of very doubtful permanency. Webber (Boston Med. and Surg. Jour., May 5, '98).

Treatment.—Rest, mental and physical, distractions, nutritious—though easily digested—food, and removal of baneful influences as far as possible constitute the predominant features of treatment. Physical and mental rest, however, do not imply the total cessation of activity, but a diminution of the work imposed upon the organism as a whole, preserving for it sufficient dynamic stimulation to activate all vital processes. The slight increase in the action of the heart derived from a short walk, for instance, increases the distribution of the food-products, and, as life is but the transformed energy of the food ingested, the primary factor of repair is thus assisted. Yet, undue exercise would, by lowering the vital powers, through fatigue, bring about a contrary effect. Metabolism being deprived of a sum of energy corresponding to the excess of exertion imposed upon the organism, its activity would be reduced in proportion and all the symptoms exaggerated.

This obviously suggests that all individuals should not be treated in the same manner, and that the just merits of each individual case should be taken as a guide. An outline of the course adopted by Weir Mitchell in severe cases will serve to illustrate the general principles of treatment. "On awaking in the morning the patient is to take a cup of cocoa, after which she is to rest for twenty minutes. She is then to get out of bed and sponge herself with cool water or be sponged by an attendant, after which she is to be rubbed dry with a coarse towel. She is then to dress

leisurely, and lie down for twenty minutes before breakfast; after which meal she is to lie down again for an hour, and rest absolutely. Massage should be given at 10 or 11 in the morning, and this be followed by an hour of rest. She then takes a cup of strong soup or, preferably, milk. The patient may then go about and attend to any duties until luncheon; and after this meal rest is also to be taken. During the afternoon the patient may walk or drive and attend to business matters; but she should not exercise more than she can possibly help. If electricity be used, it is best given just before the evening meal or at bed-time. The patient should retire early."

All the phases of a drugless treatment are herein represented, each of which must be regulated to suit the patient's means and his strength. Traveling is almost always useful, unless too arduous; the changes of scene, of the varieties of food, etc., greatly tend to alter the morbid trend of the mind and to stimulate the activities of the digestive apparatus.

Isolation is recommended by many writers when neurasthenia is accompanied by very marked symptoms of lowered nutrition and muscular weakness, and when a prolonged rest in bed is insufficient to arrest the emaciation. The other factors of the treatment here are excessive feeding and rest in bed, the latter being necessary during the first six weeks of the complete treatment. The overfeeding consists especially in the progressive administration, each day, of 3, 4, 5, and 6 pints of milk in divided amounts. Occasionally, at the end of a few weeks, one or two eggs a day may be added to the milk diet.

Electricity is extolled by many writers. As to the particular current to be used, no general rule can be laid down. Rock-

well and other authorities assert that static electricity, together with other forms of electricity, is not only a tonic or a sedative, but an eliminator of poisonous materials. It not only influences nervous action through the vasomotor system, but excites vital function by acting on the cell and its protoplasm, hastening nutritive changes and cellular activity; excretion is thus stimulated and poisons are eliminated—precisely the *desiderata* in neurasthenia. G. Betton Massey contends that there is a tendency to abuse of and overrate rest in the treatment of this condition, especially in cases that had previously led a sedentary existence. The treatment should, he thinks, embrace measures for arousing the defective activities of the sympathetic system of nerves as a principal feature, and he finds that strong galvanic currents to the abdomen and general galvanic stimulation are preferable to the routine methods of using the faradic current now prevalent.

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Electricity may be accepted as the routine treatment for neurasthenia, the particular variety to be employed varying with the subject. Local applications, especially at the beginning of the attack, are, as a rule, inferior to general electrical means, such as static baths or baths connected with alternating currents of great rapidity. The more neurasthenia is complicated by peripheral nervous troubles, such as hysterical hemianæsthesia, the stronger is the indication for the kind of electricity whose peripheral localization gives the highest tension. Here static electricity, or franklinization, is required, while in arthritic forms, or where the general nutrition is obviously affected, cellular currents, or those of high frequency, should be employed. The hysterical form with anæsthesia may yield to the simple static bath, but more often requires the use of sparks along the spine. Galvanism and

faradism are of little use in the treatment of neurasthenia. Apostoli (*Annales de l'Elect.*, Jan. 15, '98).

Hydrotherapy has also been highly recommended. In cases attended with severe dyspeptic symptoms Winternitz obtains excellent results from the following procedure: The patient is placed on his back and covered with a sheet well wrung out of cold water (from the armpits to the knees). Before covering this with a dry sheet, a coil of rubber tubing is applied to the epigastrium, through which a current of warm water at a temperature of 122° F. is passed. This procedure is employed for half an hour before each meal during a number of weeks.

The application of cold over the spine is credited with marked efficacy by Kinnear, the bags being applied from the fourth to the last lumbar vertebra.

Insomnia sometimes requires active measures, but morphine, stimulants, and all agents capable of starting a "habit" should be strictly prohibited. The bromides are also pernicious in these cases, since they tend to retard metabolism. Trional, sulphonal, amylene-hydrate, etc., have been recommended for the purpose, but the hot pack is far preferable.

Trional is the best and least dangerous of the hypnotics in the insomnia of neurasthenia. It should be administered before retiring, in varying doses, according to the degree of insomnia and the age of the patient; ordinarily 20 grains is sufficient. Claus (*La Flandre Méd.*, June 20, '95).

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Valuable results may be obtained in producing sleep in neurasthenia by means of hot pack. The patient is first sponged with cool water, and is then quickly wrapped in a blanket which has been wrung out of hot water. Outside

of this is placed a dry blanket, and about this dry blanket is also placed hot bottles. The patient breaks out into a sweat, and after this sweat has been continued for five or ten minutes, he is placed between warm blankets, rubbed off with a towel, and soon goes to sleep. D'Aulnay (*Revue de Thér.*, Mar. 15, '97).

Among the general remedies, strychnine still holds the first place. Beginning with $\frac{1}{60}$ grain, three times a day, the dose should gradually be increased until the physiological effects of the remedy appear. The dose should then be slightly reduced, and the weaker dose continued persistently until recovery becomes assured. The concentrated extract of *avena sativa*, a teaspoonful after meals in a glassful of water, the dose being gradually increased, is often effective.

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Treatment begins with removal of the cause. Then in neurasthenia there is a state of autofecation, so that either before or after any surgical interference that may be required, these poisons should be neutralized and eliminated from the system. A salt of lithia known as thialion is excellent in these cases, a teaspoonful being given in hot water before meals. In the course of thirty-six to forty-eight hours its gentle laxative effect is realized. From this time on it should be given less frequently. C. A. L. Reed (*Gaillard's Med. Jour.*, Jan., '99).

Arsenic, iron, and other tonics are often valuable. In some cases high altitudes are beneficial, owing to the increased activity and deep breathing produced and the improved nutrition that usually follows.

All disorders, primary or secondary, should be treated, those of the digestive apparatus particularly (see STOMACH, DISEASES OF), but in the majority of cases improvement of the general health causes disappearance of complications.

It is important in this class of cases

to gain the patient's confidence and to recognize his infirmities rather than persuade him that many of them are imaginary. Sympathy and consideration gain for the physician the patient's confidence and insure his co-operation in the curative measures instituted.

Physical treatment of neurasthenia, chiefly consisting in helping the patient to master the disease by exerting his reason and his will, recommended. The mental state may likewise be influenced, apart from the direct intervention of his own will, by the hypnotic method. Certain drugs, such as digitalis and iron, become very useful through suggestion, and at once produce a marked effect. James J. Putman (*Boston Med. and Surg. Jour.*, May 23, '95).

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In many cases of neurasthenia the feeling of fatigue is in no sense the expression of exhaustion, and in no way suggests or indicates that the muscles or nerves or both have been overused. In such cases this sensation is either a pure habit-symptom or one that is excited by central or other stimuli. Cases possessing this type of fatigue are usually susceptible to properly applied hypnotic suggestion, and consequently its recognition is of great importance. Morton Prince (*Boston Med. and Surg. Jour.*, June 2, '98).

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NEURITIS. See NERVES, PERIPHERAL.

NIPPLES. See MAMMARY GLAND.

NITRIC ACID.—*Acidum nitricum*, U. S. P. (hydrogen nitrate, or aqua fortis), is a transparent, colorless (or of slightly-yellow tinge), fuming (white or grayish fumes), suffocating, and caustic liquid, strongly acid and volatile with heat. It should have a specific gravity of 1.414 (42° Baumé) and contains 68 per cent. of absolute acid. It is miscible in all pro-

portions with water, and when added to alcohol decomposes it with violence. It should be kept in a dark-amber, glass-stoppered bottle, as it is decomposed by the action of light and air. It is the strongest of the mineral acids, and is usually exhibited in the dilute form.

Preparations and Doses.—*Acidum nitricum dilutum* (nitric acid, 10 per cent.), 5 to 30 minims.

Acidum nitrohydrochloricum (nitric acid, 18 per cent.; hydrochloric acid, 82 per cent.), 2 to 5 minims.

Acidum nitrohydrochloricum dilutum (nitric acid, 4 per cent.; hydrochloric acid, 18 per cent.), 10 to 20 minims.

Physiological Action.—In weak solution nitric acid slightly stimulates the tissues, but applied pure it destroys them, and is, on this account, classified as a very powerful caustic. Internally it can, of course, only be used greatly diluted, and its powers as a stimulant manifest themselves mainly upon the glandular elements of the gastro-intestinal tract. When taken internally for some time, nitric acid colors the gums as does mercury.

A very small proportion, if any, of the acid is eliminated through the kidneys; it is eliminated almost entirely through the intestines.

It is probable that nitric acid enters the blood, where it is converted into a nitrate. Some of the organic nitrates have been shown by Bradbury to stimulate the vasomotor system, the glycol-dinitrate, for instance, acting somewhat like nitroglycerin. This effect varies with the individuals, some showing comparative insusceptibility. Other nitrates act transiently as vasodilators.

Poisoning by Nitric Acid.—The symptoms of poisoning by nitric acid, in concentrated form, are those of an acute and violent inflammation of the digestive

tract induced by the ingestion of a caustic irritant. They vary in severity and rapidity of development according to the strength and amount of the acid swallowed. The fact that when nitric acid comes in contact with organic matter it imparts to it a yellow color or stain, not easily removed, aids us in differentiating the traces of nitric acid from those of sulphuric (black eschar) or hydrochloric (white eschar) acid. Thus, we may look for yellow stains on the skin, in the mouth, and perhaps on the clothing. Great pain will be present throughout the entire digestive tract, associated with vomiting of a dark matter, resembling coffee-grounds (altered blood), and occasionally portions of mucous membrane; a feeble pulse, clammy skin, and profuse bloody salivation. Renal irritation may be severe and the urine and feces may contain blood more or less altered. Death may occur either from the gastro-intestinal inflammation or from collapse. If recovery take place the patient may suffer from stricture of oesophagus, stomach, or bowels, or from more or less destruction of the peptic tubules.

Treatment of Nitric-Acid Poisoning.—There are four indications to be met: (1) to neutralize the acid through the use of alkaline solutions,—chalk magnesia, sodium or potassium carbonates, scrapings from whitewash or plastered walls, or even soap-suds; (2) to protect mechanically the corroded and inflamed tissues, through the use of white of egg, oils, and mucilaginous drinks (flaxseed-tea, barley-water, etc.); (3) to relieve the pain, through the use of opium; (4) to counteract the depression of the vital powers, through the application of external heat, the use of stimulating and nutrient enemata, and venous injections of ammonia. If pure acid in any considerable amount has been ingested, favor-

able results must not be looked for. The smallest quantity of nitric acid that has produced death was two drachms. Death ensued in two hours. Fatal accidents occasionally result from inhaling the fumes of nitric acid.

Therapeutics.—When nitric acid is taken internally it should be freely diluted and be taken through a glass tube to prevent its corrosive action on the teeth. When taken continuously for too long a period it may affect the gums like mercury (salivation and spongy gums, probably due to local action), and this should be an indication for suspending its use.

INTERNAL USES.—Nitric acid has been found to benefit patients suffering from oxaluria and from dyspepsia with phosphatic urine. Its use has also been advised in lithæmia. In stomatitis with the presence of small ulcers in the mouth and over the tongue the internal administration of nitric acid in small doses is followed by good results, especially if each ulcer be touched with a 60-grain solution of nitrate of silver. Summer and colliquative diarrhœas are favorably influenced by the internal administration of nitric acid. In chronic diseases of the liver nitric acid is useful, but nitrohydrochloric acid is better, especially in mucous duodenitis and catarrh of the gall-ducts and malarial jaundice. Intestinal indigestion associated with diarrhœa yields kindly to nitric acid; when diarrhœa is absent hydrochloric acid is to be preferred.

Chronic bronchitis and hoarseness produced by singing are said to be relieved by 10-minim doses of dilute nitric acid (Bartholow). In whooping-cough nitric acid is beneficial after the subsidence of the catarrhal stage, though some claim that it shortens the duration of the disease. Hammond, Bailey, and others have

used nitric acid with success in the treatment of intermittent fever, giving it in full doses every four or six hours. It is also of great service in relieving hepatic congestion, after the paroxysm has been arrested by quinine. It is best given combined with the bitters.

LOCAL USES.—Nitric acid used locally is caustic, astringent, or stimulant according as it is used pure or diluted. Pure nitric acid is one of the most efficient and most controllable escharotics at our command. The area of action may be limited by the application of a ring of oil or of ointment, and the depth of action by the application of alkaline solution or of soapy water. It may be applied as a caustic to phagedænic ulcers, chancre, cancrum oris, and also hospital gangrene. Warts and condylomatous growths yield to its action. On inoperative cancerous growths it may be used as a palliative. Free-bleeding hæmorrhoids may be relieved by touching the tumors lightly with the pure acid, through a speculum, and mopping the parts with oil liberally after the acid application.

Its application may be rendered painless by allowing as much cocaine as the quantity of acid used will take up, to dissolve, in it.

In **GYNÆCOLOGY** pure nitric acid may be applied to the cervix or endometrium for the cure of cervical endometritis, granular endometrium, or of small fibroid tumors. It is also used to arrest the hæmorrhage from the mucous membrane which occurs after the operative removal of polypi or small tumors.

In **RHINOLOGY** nitric acid may be used, applied in a fine wire probe lightly wrapped with cotton, to remove hypertrophy of the erectile tissue covering the middle turbinated bones. A previous application of a 4-per-cent. solution of cocaine renders the application painless.

The acid should be applied lightly and only over the space covered by the probe. It may be repeated, if required, after the slough has separated and the parts healed.

The **ASTRINGENT ACTION** of nitric acid (1 to 500 parts) is appreciated when it is used to irrigate the bladder in cases of chronic cystitis, and as well when there are phosphatic deposits in the bladder. The solution should be slightly warmed before using.

Nitric acid as a **STIMULANT** (2-per-cent. solution) is useful when applied to unhealthy ulcerations and to irritated and bleeding hæmorrhoids.

Incidentally we may note the use of nitric acid as a test for detecting the presence of albumin in the urine; the methods of applying it for this purpose are given in full under **ALBUMINURIA** in volume i.

NITRITES (including **AMYL-NITRITE**).—The nitrites may be divided into two groups: the inorganic, or mineral, including the nitrites of sodium (official), barium, calcium, potassium, strontium, and the compound salt of cobalt and potassium; and the organic group, which contains the nitrites of methyl, ethyl, propyl, butyl, and amyl (official). These latter may be subdivided into primary, isoprimary, secondary, and tertiary nitrites.

Sodium nitrite occurs as colorless, transparent, hexagonal crystals having a mildly-saline taste. It is soluble in 1 $\frac{1}{2}$ parts of water and slightly soluble in alcohol. It should be kept in a well-stoppered bottle.

Barium nitrite occurs as a white, crystalline powder or as colorless prisms. It is soluble in water and in alcohol.

Calcium nitrite occurs as deliquescent prisms or in yellowish masses. It is freely soluble in water.

Potassium nitrite occurs as white, amorphous, deliquescent sticks.

Strontium nitrite occurs as a white powder, soluble in water.

Cobalt and potassium nitrite (cobalt yellow) occurs as a yellow, microcrystalline powder, which is slightly soluble in water.

Ethyl-nitrite (nitrous ether) occurs as a yellowish, highly-aromatic, ethereal, inflammably, and exceedingly-volatile liquid. It is used in the form of a spirit (spirit of nitrous ether). When added to water it rapidly disintegrates, and should not be mixed before using.

Amyl-nitrite (iso-amyl-nitrite) occurs as a yellowish, transparent, very diffusive, unstable liquid, having a penetrating, fruity odor. It is soluble in chloroform, alcohol, and ether. It should be kept away from the fire and the light in a dark, well-stoppered bottle.

Preparations and Doses.—Amyl nitris, U. S. P., 2 to 4 minims by inhalation from a handkerchief or given in brandy.

Potassii nitris, $\frac{1}{4}$ to 2 grains.

Potassii cobalto-nitris, $\frac{1}{4}$ to $\frac{1}{2}$ grain.

Sodii nitris (U. S. P.), $\frac{1}{2}$ to 2 grains.

Spiritus ætheris nitrosi (U. S. P.; alcoholic solution of ethyl-nitrite), $\frac{1}{2}$ to 4 fluidrachms.

Physiological Action.—An important feature of the influence of amyl-nitrite is that upon the circulation. The effect upon the pulse begins a few seconds after inhalation; the arterial tension is lowered to the utmost point in from 40 to 60 seconds, remains extremely low for 30 seconds, then rises suddenly, and 1 $\frac{1}{2}$ minutes afterward is only a little lower than it was before the inhalation. A small dose of sodium nitrite (2 grains) distinctly affects the pulse in from 2 to 3 minutes; the point of the lowest tension is reached in from 8 to 20 minutes, and any noticeable influence ceases in

from 2 to 3 hours. Slowness and irregularity of the pulse, with slight intermissions, are sometimes observed, but these irregularities become less, or entirely disappear, soon after the administration of the drug. The nitrites, in very small amounts, affect the circulation. Thus, $\frac{1}{16}$ grain will produce a marked action in most people. Experimental evidence appears to have shown that under the influence of the nitrites the lungs are temporarily dilated, the work of the right heart being thus relieved to a certain extent. Again, they do not markedly influence the function of the kidneys, there being no alteration in the flow of urine, notwithstanding that the renal vessels are dilated. Neither do they exercise any noticeable influence on the temperature, except when given in toxic amounts. The organic nitrates and the nitrites possess similar properties, this being due to the probable conversion of the nitrate-molecule into the nitrite-molecule. (Leech.)

Nitrite of amyl influences the circulation, mainly by paralyzing the muscular supply, but markedly stimulates the heart in every way. This tends to induce cardiac paralysis and arrest in diastole if the administration be unduly prolonged. It also causes excitement of the motor functions and a slight paresis of the sensory processes (Kraepelin). This is followed by loss of motor activity in cases of poisoning, and paralysis of respiratory centres. The blood is also affected, methæmoglobin being formed out of the corpuscular hæmoglobin.

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Experiments on animals show that in mice sodium nitrite causes death by its action on the hæmoglobin, and not by any direct poisonous action on the tissues. A fatal dose of nitrite may be recovered from if the tissues are sup-

plied with a sufficiency of oxygen. Very large doses of sodium nitrite (1.3 grammes per kilo of body-weight) caused death of the animal within fifty minutes, even when the animal was kept in oxygen at high pressure, the fatal result being due to the action of the drug upon the tissues. The same dose caused death in under twelve minutes, if the animal remained in the air at the ordinary pressure.

Amyl-nitrite and also isobutyl-nitrite were found to cause death even in compressed oxygen, but the time between the administration and the fatal event was five or six times the time required when the animal was in ordinary air. Amyl-nitrite causes death in air solely in virtue of the action of the nitrite group upon the hæmoglobin; in compressed oxygen death is caused by the amyl group.

Nitroglycerin in mice and rabbits is only slightly poisonous; in very large doses poisonous effects are produced from the direct action of the drug on the tissues, before any symptoms are produced by decomposition of the hæmoglobin, or nitrite formation. Compressed oxygen in no way relieved the symptoms.

Number of experiments made upon the blood-changes produced by the nitrites. These drugs convert hæmoglobin not simply into methæmoglobin, but into what appears to be a mixture of methæmoglobin and nitric-oxide hæmoglobin. This conversion is never complete in the living body; the maximum of change found at death was 91 per cent., 9 per cent. of the hæmoglobin being left unaltered; in non-lethal doses of sodium nitrite 56.5 per cent. of altered hæmoglobin was found in a rabbit, which afterward recovered.

Amyl-nitrite converts hæmoglobin at first into a mixture of methæmoglobin and nitric-oxide hæmoglobin, but if excess of the drug is allowed to act, a further change into photomethæmoglobin occurs, and still further changes result from a more prolonged action.

In men and other animals after overdoses of sodium nitrite the cyanosis is undoubtedly due to the changes in the hæmoglobin; the other symptoms—such

as palpitation, throbbing of the head, headache, nausea, and loss of muscular power—are exactly similar to those met with in cases of carbonic-oxide poisoning, and are characteristic effects of defective oxygen-supply to the tissues.

From the fact that only ten grains or even less are required to produce serious symptoms in men, it would seem that a much smaller dose per kilo of body-weight affects the blood in men than in mice and rabbits. J. Haldane, R. H. Makgill, and A. E. Mavrogordato (*Jour. of Phys.*, Mar., '97).

Poisoning by the Nitrites.—The symptoms of poisoning by amyl-nitrite are throbbing headache, flushed face, sense of heat, tumultuous heart's action, and diminished sensibility, mobility, and reflexes. Recovery has followed from a dose of 12 grammes (3 drachms). Death mainly occurs as the result of paralysis of the respiratory centres.

Treatment of Poisoning.—If the poison has been swallowed, evacuation of the stomach is desirable, providing the patient is seen soon enough. The recumbent position and an abundance of fresh air may be supplemented advantageously by the use of artificial respiration and the administration of stimulants, strychnine, ergot, and digitalis by hypodermic injection, or by the mouth if the patient can swallow.

In a case of poisoning by amyl-nitrite cocaine successfully employed as an antidote. The patient had accidentally spilled 46 minims on the bosom of her dress and had not immediately changed it. She complained of the most violent headache, palpitation, dimness of vision, and yellow vision. Consciousness was retained, the gait was staggering, and the carotids pulsated violently. Fifteen and one-half minims of a 5-per-cent.-cocaine solution were injected subcutaneously, and in a few minutes the worst symptoms of the poisoning subsided, and in fifteen minutes quite disappeared. Schilling (*Med. Press and Circ.*, Nov. 29, '93).

Therapeutics.—The general therapeu-

tic indications of the various members of this group are very similar. The choice of the remedy and the method of administration will depend upon the desired rapidity of action and permanence of effects, modified by any untoward or characteristic symptom which may follow the administration of any individual member of this group. When rapidity of action is desired, amyl-nitrite claims first place. When a prolonged effect is desired, sodium or potassium nitrite or, better, potassium cobalto-nitrite may be used. Gastric irritation occasionally follows the use of the nitrites of sodium, potassium, and ethyl. Headache more frequently follows the use of the amyl, isobutyl, and propyl compounds, and, less often, after the nitrites of sodium and ethyl. The pulse is most accelerated by the amyl-nitrites; sodium and ethyl-nitrites cause only slight acceleration. Isobutyl and secondary propyl compounds are more active in lowering the blood-pressure (Cash). Isobutyl-nitrite is more reliable than amyl-nitrite for the relief of anginal pains (Leech). Ethyl-nitrite and the officinal spirit of nitrous ether act especially on the skin and kidneys, increasing the perspiration and the secretion of the urine.

The general indications for the exhibition of the nitrites are primarily: the presence of general or local muscular spasm, and, secondarily, the presence of pain incident thereto. The nitrites are therefore valuable in various cardiac, pulmonary, and nervous disorders attended by angiospasm and increased blood-pressure (high arterial tension).

CARDIAC DISORDERS—In angina pectoris we note the presence of cardiac distress, associated with radiating muscular pain and increased arterial tension: a symptom-complex controlled and relieved by the exhibition of the nitrites.

Amyl-nitrite is generally preferred at the time of the paroxysm; the alkaline nitrites may be used in the intervals, as their action is more prolonged.

For prompt and immediate relief to the pain of angina, or breathlessness due to vasomotor and bronchial spasm, that so often accompanies the senile heart, there are two drugs of supreme importance,—nitrite of amyl and nitroglycerin, —the latter having the most persistent action, and being, therefore, preferable. The tablets containing $\frac{1}{100}$ grain are the most convenient. One or two of these may be taken on any indication of pain or spasm, and the dose may be repeated several times a day if required. Balfour (*Edinburgh Med. Jour.*, June, '91).

[Grainger Stewart has pointed out that nitrite of amyl has a direct effect on nervous structures, and that it relieves other forms of neuralgia. Patient personally seen, however, with his countenance purple and the vessels almost bursting from overengorgement, due to the influence of nitrite of amyl, without experiencing the slightest relief to his anginal attack. Still, it is readily admitted that nitrite of amyl and its allies do relieve some anginal attacks, and to a certain extent, and in some cases, by the lowering of the vascular tension, without, however, admitting that there is a direct causal relationship between the anginal attacks and heightened arterial tension. E. N. WHITTIER and E. M. GREENE, Assoc. Eds., *Annual*, '94.]

Sodium nitrite being stable, may replace the less stable amyl- and ethyl-nitrites. It dilates all the arterioles rapidly, and thus soon relieves the heart. Disagreeable symptoms may be overcome by prescribing it with ammonia-water or spirit of chloroform and small doses of morphine. It is most useful in anginal affections and in irregular heart-action. To obtain most benefit from its use it should be continued some time after all symptoms have passed off. The maximum dose is 4 or at most 5 grains, and generally 1 or 2 grains are enough. Graves's disease would appear to be aggravated, and bronchitis and asthma are

not benefited by its use. Gordon Sharp (*Practitioner*, May, '94).

In cardiac dyspnoea the nitrites are valuable, caution, however, should be observed not to exceed 5 minims of amyl-nitrite by inhalation where fatty degeneration is present. H. C. Wood recommends the nitrites in aortic insufficiency with excessive hypertrophy and severe frontal headache.

In syncope and cardiac failure following general anaesthesia (especially chloroform), shock, etc., amyl-nitrite by inhalation is strongly recommended by Edward Rice.

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Case of girl, aged 7 years, who suddenly ceased respiration during tenotomy for squint under chloroform anaesthesia. Head and shoulders were lowered, and artificial respiration begun, but the child appeared quite dead.

Amyl-nitrite was poured on a piece of lint, and held over the nose and mouth; but for some time there was no response, so more and more nitrite was poured on the lint, till at last a sob was heard during the interval between the artificial respiratory movements. Still keeping these up, sure signs of life appeared, and the operation was concluded. G. E. Walker (*Brit. Med. Jour.*, Aug. 7, '97).

PULMONARY DISORDERS.—The use of the nitrite of amyl has been suggested for the relief of the dyspnoea of asthma and bronchitis. Its influence is, however, too short, and the amelioration is only temporary. Better results follow the use of the alkaline nitrites, since they disintegrate more slowly and their effects are, therefore, more prolonged. Their action is also less sudden. In nervous asthma, when the attacks are periodical, the inhalation of a few drops of amyl-nitrite will be found useful at the beginning of the paroxysm, followed, if necessary, by small doses of sodium or ethyl-nitrite or nitroglycerin for more permanent effects.

In uræmic dyspnœa the effects of amyl-nitrite are too transient. Bals and Brog-lis recommend the tertiary nitrite of amyl (not official) by inhalation in rather large doses (80 to 100 drops daily). They claim that it does not cause heat, tension, throbbing of the head, or other inconvenience, and is, moreover, an hypnotic.

Nitrite of amyl best administered in a mixture combined with glycerin, 3 minims to 1 drachm, adding 3 drachms of water, and taken at intervals in the course of an hour; it may be further diluted, if desired. Sir B. W. Richardson (*Asclepiad*, 4th Qr., '94-'95).

NERVOUS DISORDERS.—In epilepsy the inhalation of amyl-nitrite during the aura will ward off the paroxysm. In hysterical paroxysm, catalepsy, and hystero-epilepsy, the attacks may be cut short by repeated inhalations of the same remedy; it is especially useful in the emergencies of these diseases. In tetanus a severe paroxysm of muscular spasm is often present while the patient is being fed. Here the inhalation of a few drops of amyl-nitrite may avert death by relaxing the tonic spasm of the respiratory muscles. In cerebral anæmia the effects of the nitrites are beneficial, but transitory. The vertigo of seasickness may be relieved by inhaling a few drops of amyl-nitrite upon the first appearance of the nausea (A. L. Loomis). In Raynaud's disease J. T. Eskridge advises inhalations of amyl-nitrite in the stages of asphyxia and syncope; relief follows the prompt dilatation of the capillaries through the action of the remedy.

Inhalations of nitrite of amyl recommended in epilepsy before the convulsions. It may also be used in the treatment of pertussis. J. P. Parkinson (*Brit. Med. Jour.*, Sept. 14, '93).

GYNÆCOLOGICAL DISORDERS.—The reflex vasomotor disturbances of the climacteric and menstrual periods, depressed mental condition, cold hands and

feet, peculiar flushings, hysterical manifestations, and at times pain are relieved by the nitrites.

Value of amyl-nitrite often verified for the relief of the peculiar flushings and depressed mental condition of the climacteric period in the female; as also for the nervous and hysterical troubles of younger women, characterized by suffocating spells, spasms, cold hands and feet, etc. In these cases the remedy may be employed internally, in doses of from $\frac{1}{1000}$ to $\frac{1}{100}$ of a drop in cold water, or in larger amounts by inhalations. Arthur Devoe (*Med. Summary*, Mar., '92).

Tachycardia of menopause. Solution of nitrite of amyl, 5 minims to the ounce of water, a teaspoonful every fifteen minutes until relieved. Baldwin (*Brooklyn Med. Jour.*, Nov., '95).

NEURALGIA.—Neuralgic dysmenorrhœa, when due to muscular spasm, is promptly relieved by the inhalation of a few drops of amyl-nitrite (Mary Putnam-Jacoby). Migraine attended by angio-spasm and headache due to cerebral anæmia are relieved by amyl-nitrite inhalations.

ANTIDOTAL USES.—Rüdsky describes an interesting case of cocaine poisoning in which nitrite of amyl proved to be an efficient antidote. Several cases have since been reported. H. C. Wood advises the use of amyl-nitrite inhalations to lessen the spinal reflexes in cases of strychnine poisoning. He has demonstrated, by experiment, recovery after the administration of double the ordinary fatal dose of strychnine, through the use of amyl-nitrite as the only antidote.

Case of poisoning by cocaine in which nitrite of amyl proved to be a successful antidote. Case in which woman took 1 grain of hydrochlorate of cocaine for headache. A drachm of ipecacuanha produced no vomiting and nitrite of amyl was then resorted to, through inhalations by means of a handkerchief, this being about 40 minutes after the

taking of cocaine. Almost instantly the cyanosis and pallor of the face disappeared, respiration became freer, and the pulse fuller and slower. An hour afterward a relapse occurred, but was again immediately relieved by inhalations of the nitrite of amyl. Twelve drops, in all, of the amyl-nitrite were inhaled, and for internal administration, as adjuvants, wine and infusion of black coffee were given. Recovery finally took place. Alexander P. Rüdsky (Med. Obozrenije, No. 5, '90).

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NITROBENZENE.—Nitrobenzene (nitrobenzol, essence of mirbane, oil of mirbane, artificial oil of bitter almonds) is an almost colorless oily liquid, having a very sweet taste and the odor of bitter almonds. It is used in the manufacture of perfumes and in the aniline industry. It is never used medicinally. It is of interest to the physician only on account of its poisonous properties.

Poisoning by Nitrobenzene.—The inhalation of the fumes of nitrobenzene produce a sense of weariness, headache, numbness in the head, confusion, and drowsiness. There is marked cyanosis, the lips become bluish, and, later, nearly black. Convulsions may ensue and death may follow by asphyxia. When taken internally, the appearance of the symptoms may be somewhat delayed and, in addition to the symptoms before named, the whole body may acquire a bluish color, the pupils dilate; the respiration become rapid, irregular, and shallow; the pulse become accelerated and thready, later imperceptible; the muscles completely relaxed, and consciousness may be lost. Death has occurred after taking nine drops internally.

Treatment of Poisoning by Nitrobenzene.—If poisoning has occurred from inhalation, benefit is obtained from cold

applications to the head, warmth applied to the trunk and extremities by means of hot-water bags or bottles, stimulants, hypodermics of strychnine, and the use of massage and artificial respiration. If the poison has been taken internally, the use of apomorphine or other emetics followed by lavage of the stomach and liberal doses of hydrated oxide of iron, whisky, dilute ammonia, etc., is indicated.

Case of poisoning by nitrobenzol saved by washing out the stomach and excitation. B. Graselli and F. Giaroli (Gaz. degli Osp., No. 14, '94).

NITROGLYCERIN.—Nitroglycerin (glonoin, trinitrin, or glyceryl-trinitrite) is used in medicine only in diluted form. In the pure state it is a violent explosive. Two solutions are in use: a watery and an alcoholic solution. The latter only is official.

Physiological Action.—In general, its action is similar to that of the nitrites, being, however, slower but more permanent than that of amyl-nitrite, and influencing the vascular system more quickly than sodium nitrite, but with greater and more lasting headache.

Preparations and Doses.—Spiritus glonoini, U. S. P. (1-per-cent. solution in alcohol), $\frac{1}{4}$ to 1 drop.

Poisoning by Nitroglycerin.—The symptoms of poisoning by nitroglycerin are similar to those of poisoning by the nitrites. It is interesting to note in this connection, however, that patients rapidly acquire a tolerance to this drug. G. E. Reading records a case of chronic nephritis in which, after a year of treatment, 1 drachm of a 10-per-cent. solution (6 grains of nitroglycerin) was taken daily with apparent cure of the symptoms. D. D. Stewart has reported similar cases.

The treatment of poisoning by nitroglycerin is similar to that of poisoning by the nitrites.

Therapeutics.—**CIRCULATORY DISORDERS.**—Nitroglycerin is a valuable remedy in the treatment of angina pectoris. While amyl-nitrite is generally conceded to be the best remedy for relieving a paroxysm on account of the rapidity with which it acts, nitroglycerin is preferable at other times by reason of its more permanent influence. It is always well to begin with small doses until the susceptibility of the patient is ascertained, as small doses affect some persons profoundly. Hoffman advises beginning with an hypodermic dose of $\frac{1}{120}$ to $\frac{1}{60}$ grain. When the susceptibility is ascertained, the best effects are produced by pushing the remedy to the point of tolerance. Larger doses are necessary in this disease than in almost any other spasmodic affection. Leech had to raise the dose to 20 minims of 1-per-cent. solution, and a larger dose may be required. Cardiac and pulmonary dyspnoea are relieved by nitroglycerin, but, as in the use of the nitrites, great care should be exercised if the patient has a fatty heart. Bartholow has advised nitroglycerin in certain cases of anæmia.

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In angina pectoris nitroglycerin should be used, and its dosage should be pushed to the requirements of the case. Nitrite of amyl is preferred to meet the paroxysms. Commencing with doses of nitroglycerin of $\frac{1}{100}$ grain three times a day, they should be increased until the patient takes four or five or even more times as much three times a day—care being taken to select an active preparation, and being guided by the flushing of the face and throbbing of the head as to its activity. Oster (N. Y. Med. Jour., Nov.-Dec., '96).

Conclusions in regard to nitroglycerin are as follow: 1. It is only when deal-

ing with arteries in which there is no more than the normal tonicity of the walls that the drug is liable to produce disagreeable effects. Under this condition it should be administered with caution and in small doses. 2. In cases of arterial tension the drug can be used more freely than has been customary among practitioners, the dose being proportioned to the degree of tension. 3. In cases of arterial tension tolerance of the drug is rapidly acquired, and by a slight increase day by day very large doses can soon be taken with safety, the constant guide being the degree of tension in the arterial wall. W. L. Armstrong (Med. News, Oct. 31, '96).

RESPIRATORY DISORDERS.—Spasmodic asthma in the early stage, before any serious structural changes have taken place, is favorably influenced by nitroglycerin. The engorgement of the mucous membranes of the bronchial tubes is relieved and the tension on the organs of circulation is lessened. Hiccough, pertussis, and laryngismus stridulus are relieved by nitroglycerin. A. H. Smith recommends drop doses of a 1-per-cent. solution for threatened collapse in pneumonia.

RENAL DISORDERS.—In Bright's disease nitroglycerin lessens the arterial tension and relieves heart-strain. Here it is again best to begin with small doses and increase, as tolerance at each step is established. (Bartholow, Robson, Da Costa, *et al.*)

In cases of nephritis accompanied with dyspnoea, in which the use of opium or morphine is contra-indicated, nitroglycerin is of the greatest advantage, and produces prompt relief. C. S. Stewart (Med. News, Dec. 5, '91).

GASTRO-INTESTINAL DISORDERS.—Nitroglycerin is advised by Humphreys against all kinds of vomiting, except that of pregnancy and of peritonitis. Reflex vomiting is especially amenable to its favorable influence.

Seasickness is often relieved with great promptness by nitroglycerin. It will relieve the pain in gastralgia. Nitroglycerin is of especial value in the algid stage of cholera. One or two drops of a 1-per-cent. solution on the tongue dilates the peripheral blood-vessels, diminishes the blood-pressure, and relieves the heart. (Trussewitsch.)

NERVOUS DISORDERS.—In cases of hystero-epilepsy $\frac{1}{100}$ grain of nitroglycerin administered hypodermically will control the spasm. In epilepsy nitroglycerin is not so efficient to prevent the attack as amyl-nitrite. In Raynaud's disease great relief follows the administration of $\frac{1}{100}$ -grain doses of nitroglycerin three times daily. A large number of rebellious cases of sciatica have been cured through the use of nitroglycerin (Mikhalkine and Krauss).

In migraine, with blanched face, nitroglycerin is strongly indicated. In migrainous headaches, when the paroxysms are periodical, Gowers advises the administration of the remedy three times daily. In neuralgia of the trigeminal nerve due to insufficient blood-supply, nitroglycerin is a reliable remedy. In cephalalgia due to cerebral anæmia it affords prompt relief. It has also proved valuable in sciatica.

Under the influence of nitroglycerin two cases were radically cured of their sciatica, and in the third case marked improvement took place. The trinitrin was administered either in the form of a 1-per-cent. solution in alcohol, of which the patients took 3 drops daily, or in the following mixture:—

R. One-per-cent. alcoholic sol. trinitrin, $1\frac{1}{4}$ fluidrachms.

Tr. capsici, $1\frac{7}{8}$ fluidrachms.

Aq. menth., $3\frac{3}{4}$ fluidrachms.

Dose: Five to ten drops three times daily. Mikhalkine (*Jour. de Méd.*, Apr. 21, '95).

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Seven cases in which nitroglycerin was used in the treatment of sciatica.

Of these seven patients, all received marked benefit from the very beginning of this mode of treatment. In the acute cases they recovered in from ten days to a month; in the chronic cases they improved notably, and gained daily.

The drug was administered in the form of a 1-per-cent. alcoholic solution, beginning with the dose of 1 minim three times a day, and increasing up to 4 minims if found necessary, or in the form of tablets containing $\frac{1}{100}$ grain given three times daily. Bitter tonics, codliver-oil, etc., and other measures for improving the general conditions were also employed.

The only discomforts arising from the use of the drug were congestive headache and flushing of the face, sometimes following the first dose of the medicine, sometimes supervening only when the maximum doses were administered. To counteract these effects bromides may be given. Krauss (*N. Y. Med. Jour.*, Feb. 29, '96).

MISCELLANEOUS DISORDERS.—The cold stage of intermittent fever may be aborted by the hypodermic administration of nitroglycerin or by the inhalation of amyl-nitrite. A few drops of a 1-per-cent. solution of nitroglycerin on the tongue is said to relieve the craving for opium (*J. V. Shoemaker*).

For the relief of muscular spasm, present in renal and hepatic colic, there is no more powerful remedy than nitroglycerin, and the same is true in cases of spasms of the bowels and stomach, whatever their source. The drug acts more promptly when given by the mouth than when administered hypodermically. *J. H. Upshur* (*Va. Med. Monthly*, Feb., '91).

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Case of gall-stone colic promptly relieved by nitroglycerin. The use of nitroglycerin in biliary colic is suggested by its known paralyzing action on unstriated muscular tissue. Presumably it

relaxes the spasm of the gall-bladder and ducts. G. L. Turnbull (*Lancet*, 1, p. 353, '96).

Nitroglycerin used as an hæmostatic in four cases of hæmoptysis with uniformly favorable results. L. W. Flick (*Phila. Med. Jour.*, Feb. 12, '98).

Antidotal Uses.—In poisoning by illuminating gas nitroglycerin administered hypodermically acts as a prompt restorative. Speer records a case in which nitroglycerin was successfully used as an antidote in morphine poisoning, 6 grains of morphine having been taken by a lad aged 17 years. An injection of $\frac{1}{50}$ grain was soon followed by an improvement in the respiration, and, in half an hour, by vomiting, after which $\frac{1}{100}$ grain was given. Two hours later the patient was out of danger.

One-fiftieth grain of nitroglycerin administered hypodermically to a girl poisoned with illuminating gas, with the happiest results. She had been exposed to the injurious effects of the gas for seven hours, and when seen was perfectly comatose and unable to swallow. W. C. Kroman (*N. Y. Med. Jour.*, Oct. 26, '93).

NITROUS OXIDE.—Nitrous oxide (nitrogen monoxide, protoxide of nitrogen, laughinggas) is a colorless, transparent gas of neutral reaction, sweetish taste, and almost odorless. It may be made by heating ammonium nitrate in a flask or retort, which decomposes it into nitrous-oxide gas and water. To free it from any trace of acid or nitric oxide the gas should be passed through a solution of potassium hydrate, then through a solution of ferrous sulphate, and finally be left in an inverted jar over water for twenty-four hours. The gas may be liquefied by pressure: a fact that enables it to be carried about in cylinders. It is readily converted into the gaseous state when wanted by allowing it to escape into

a rubber bag, the relief from pressure inducing the change of state from liquid to gas. Nitrous-oxide gas was discovered by Priestly. Its anæsthetic properties were first recognized by Sir Humphry Davy. It was first used practically by Horace Wells, a dentist of Hartford, Conn.

Physiological Action.—Hare and Cerna summarize the physiological action of nitrous-oxide gas as follows: It causes a rise of arterial pressure, followed by a fall, the rise being due to vasomotor stimulation and the fall to vasomotor palsy. There is also marked slowing of the heart, which is believed to be due to stimulation of the inhibitory centre in the medulla oblongata. Finally, the slow pulse is changed into a very rapid one, due to vagal palsy. Experiments prove that the cause of the anæsthesia produced by this gas is due to asphyxia; for, if enough oxygen be inhaled simultaneously to equal the proportion of oxygen in ordinary air, anæsthesia does not appear. This addition of oxygen prevented the rise of arterial pressure usually produced by the gas, but did not interfere with the changes in the pulse-rate and force. For this reason it is believed that the action of the remedy upon sensation and the vasomotor system is separate from that upon the heart and its supplying nerves.

Under the administration of the gas the blood-corpuscles darken markedly, and the cyanosis is due to this and the diminution in the amount of oxygen present. There is no chemical conversion of the gas circulating in the blood. It enters the body and leaves it as nitrous oxide. The oxyhæmoglobin spectrum of the blood is unaltered. It is not an asphyxiant, for narcosis occurs *before* the oxygen is exhausted. The heart's action is influenced but little, and pulsation continues for perhaps one minute. In com-

plete narcosis there is a change in calibre of the renal vessels to correspond with change in arterial pressure; renal secretion is rapidly lessened, and transitory albuminuria and glycosuria may occur. (McCardie)

Therapeutics.—Nitrous oxide is principally used by dentists for the painless extraction of teeth. It is also used as an anæsthetic for minor surgical operations of short duration, for opening abscesses, boils, or felons; for tenotomies; and for reduction of fractures, dislocation, etc. It may be administered alone, mixed with air or oxygen, or alternately with either. When used pure, anæsthesia is more quickly induced. For the weak, the aged, or the very young, it is best given mixed with oxygen. Hare reports a case of death after the inhalation of the gas—not as one of death due to the direct influence of nitrous-oxide gas, but as an instance of the fact that the decided rise of arterial pressure which is produced by the administration of this drug during the period of anæsthesia may cause the rupture of a blood-vessel in persons who have a tendency to apoplexy. Yet the mortality of this anæsthetic is practically *nil*. In the United States, where it is used extensively, the mortality, according to McCardie, has been less than one in one million administrations.

In producing narcosis a semirecumbent posture should be avoided; the patient should sit upright, with his head supported on a rest connected with the chair.

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The idea that it is dangerous or injurious to prolong nitrous-oxide anæsthesia is not supported by facts. Pure gas, with occasional breaths of air, personally given for periods of over 10 minutes in nearly 200 cases, the longest administration in the series lasting 50 minutes, without the occurrence of any dis-

quieting symptoms. The patients, too, recover quickly, and no bad after-effects ensue either on the same or on the following day. H. J. Patterson (Brit. Med. Jour., Jan. 22, '98).

Following is a modification of Coxons's method of prolonging nitrous-oxide anæsthesia during dental operations. It consists in closure of the nares by digital compression, thus preventing the escape of nitrous-oxide gas from the naso-pharynx, whence it escapes through an especially-constructed tube. This oral tube, which has an internal diameter of about $\frac{1}{2}$ inch, and is made to fit Hewitt's gas apparatus, is substituted for the face-piece when once the patient is under the influence of the gas. By this procedure the patient may be kept under the effects of the anæsthetic for four to five minutes. W. J. McCardie (Lancet, Aug. 6, '98).

In a series of two hundred and fifty consecutive cases results following administration of nitrous-oxide gas by the open method have been uniformly successful. It is erroneously stated that the admission of air interferes with the effect of the gas.

By the use of an inhaler, which is completely open at the top and into which the gas is allowed to fall by atmospheric pressure, from the end of a supply-pipe held over it, the full anæsthetic effects of the gas can be obtained. The administration of the anæsthetic may be continued for eleven minutes, without any disturbance of pulse or respiration. Neither have any subsequent ill effects been observed. George Flux (Lancet, Feb. 4, '99).

Nitrous Oxide and Oxygen.—Practical evidence and general results of experiments with nitrous oxide on animals have shown that it is possible to get a mixture of oxygen and nitrous oxide which will contain sufficient oxygen to maintain for a length of time the vital function, and yet have so little oxygen that consciousness would be lost. The experiments of Wood have shown that in the dog 6 per cent. of oxygen in the ni-

trous oxide is probably the nearest approach to a practical anæsthetic mixture that can be made. Although theoretical evidence has suggested that nitrous oxide acts merely by shutting off oxygen from the blood, clinical evidence would seem to prove that the anæsthetic effect is preserved when oxygen is administered concomitantly and that safety is still further insured.

F. N. Hewett and others affirm that the combined use of nitrous oxide and oxygen is the safest method of anæsthetizing at present known, and the unpleasant after-effects of anæsthesia may usually be avoided when it is employed; but the anæsthesia induced is not so deep as that produced by ether or chloroform, the muscular system is not so completely relaxed, and is not always possible to prevent reflex and other movements during administration. The best results with nitrous oxide and ether have been with children and weak women. Strong, vigorous male adults, especially drinkers or excessive smokers, are bad subjects. It is important to avoid the ingestion of solids and fluids for several hours after the administration of this agent.

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NUCLEINS.—Nuclein is the principal proteid found in the nuclei of the cells of plants and animals or of yeast. It is an amorphous substance rich in phosphorus. On boiling with alkalis phosphoric acid is set free. Physiologically, nucleins may be said to form the chief chemical constituents of the living parts of cells. The number of kinds of nucleins is limited only by the varieties of cells. Chemically, the nucleins are complex proteid bodies characterized especially by the large amount of phosphorus they contain. The phosphorus exists in the form

of nucleinic acid, which is combined with a highly complex basic substance, the nucleinic acid of all nucleins being the same, the basic portion differing in the various nucleins. The basic substance, on decomposition, yields one or more of the xanthin bodies. The nucleins in general are insoluble in dilute acids and soluble in dilute alkalies; hence they resist peptic digestion and in this way may be separated from most other proteid bodies (Vaughan). Certain substances, histologically and functionally nucleins, do not yield any xanthin base (adenin, guanin, sarcin, xanthin) as a decomposition-product. These are called par-nucleins. Some of these are the antecedents of true nucleins (Vaughan). Some nucleins are combined with albumins, forming compounds known as nucleo-albumins. When one of these bodies is submitted to peptic digestion, the albumin is converted into a peptone, and the nucleins form an insoluble precipitate (Vaughan).

The nucleins may be obtained from many sources—from yeast, casein, the nuclei of blood- and pus- corpuscles, the liver, the spleen, bone-marrow, the thyroid and thymus glands, the testicles, the brain, or any structure containing numerous cell-elements. Commercially, nuclein is generally derived from yeast-cells, and occurs as a dry powder or dissolved in a weak alkaline menstruum.

Therapeutics.—Nuclein has been used with apparent benefit in the initial stages of pulmonary tuberculosis, in septicæmia, in amygdalitis and pharyngitis, in pseudodiphtheria, and as a dressing and injection for indolent ulcers. Ferguson, of Toronto, successfully used nuclein in a case of progressive anæmia, in the treatment of which all the other remedies used had failed.

Jacobsohn, of New York, attributes

immunizing and curative properties to nuclein in cases of diphtheria, scarlet fever, and measles. The injection of a nuclein solution seemed to abort the attack and quell the complications. The dose given was 5 minims of nuclein solution. He ascribes to nuclein whatever efficiency the diphtheria antitoxins and other cognate remedies may have. Hitchcock, of Detroit, observed a case of hip-joint disease in which great improvement followed the systematic use of nuclein injections every second day. The patient ultimately recovered, and Hitchcock attributes the result "very largely, if not entirely, to the long and persistent use of nuclein."

CONTRA-INDICATIONS.—Nuclein should not be given for long periods to gouty persons, as the researches of Horbaczewski, Weintraub, and Richter show that the administration of nuclein, or of foods containing a large proportion of nuclein in their composition, increases notably the formation of uric acid.

NURSING AND ARTIFICIAL FEEDING.

Breast-milk.

PHYSICAL PROPERTIES.—Breast-milk is slightly bluish and opalescent; it is sweet, and has an alkaline or occasionally neutral reaction. Under the microscope are seen fat droplets and granular matter; if milk from the colostrum-period is examined, there are also epithelial cells and leucocytes undergoing fatty degeneration,—"colostrum corpuscles,"—and the fat-droplets are found of varying sizes.

CHEMICAL COMPOSITION.—The nutritive ingredients are:—

1. *Water*, constituting from 85 to 90 per cent.

2. *Fat*, in the form of minute globules held in emulsion by the soluble proteid.

If the milk stands, the fat collects at the top as cream. In a good specimen the percentage varies from 3 to 5, the average being about 4.

3. *Sugar*.—The carbohydrate of milk is lactose, or milk-sugar. Its proportion is remarkably constant: 6 to 7 per cent. during the whole nursing-period.

4. *Proteids*.—Casein and lactalbumin are the principal forms. The lactalbumin is in solution, and is the more readily digested and absorbed; its amount is about twice that of casein. The casein is in suspension, and is readily precipitated; the curd formed by adding acetic acid to breast-milk is in fine flocculi, thus differing from that of cows' milk, which comes down in dense masses. In a good specimen the proteids vary from 0.75 to 2.0 per cent., the average being about 1.25 per cent.

5. *Salts*.—The most important salts are calcium phosphate and potassium carbonate. Altogether the salts amount to about 0.2 per cent.

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During the later months of lactation the milk regularly deteriorates, the loss being most marked in the proteids and total solids. At any time, reduction of the proteids is apt to be a sign of failing lactation. Vanderpoel Adriance and J. S. Adriance (*Archives of Ped.*, Jan., Feb., '97).

Analysis of ninety-four samples of human milk, all taken within the puerperal month, shows that wide variations in the several ingredients of breast-milk are met with. Greatest variation was observed in the fat; in one case its percentage reached 8.82, the lowest being 4.38. Average composition of mother's milk, according to personal analysis: Water, 88.10; fat, 3.08; sugar, 6.75; proteids, 1.87; and ash, 0.25. Some variations in fat were probably due to position of mother when milk was withdrawn; if in a prone position, cream is drawn off first. There were five deaths among forty-two children, and in each

of the fatal cases the percentage of proteids in the mother's milk was high, ranging from 2.05 to 4 per cent. In all cases excepting three the milk agreed with infant when proteids exceeded 2.5 per cent. Variation in percentage of other ingredients seemed to be more easily borne. Richmond (Brit. Med. Jour., Jan. 22, '98).

Clinical Examination.—While a complete chemical analysis of the milk is desirable, this is often impossible; and the physician must depend on his own simple tests.

The QUANTITY may be estimated from the amount which can be drawn with a breast-pump; but the most reliable test is to weigh the infant before and after nursing on scales sensitive enough to record differences of half an ounce. The average result of two or three such weighings will be sufficiently definite.

The QUALITY of the milk, or, at least, *whether very rich or very poor*, can be made out by the following procedures. The specimen taken for examination should be the entire amount of milk that can be pumped from one breast.

ESTIMATION OF THE FAT.—A cylindrical glass tube, holding 10 cubic centimetres and graduated to hundredths, is filled with breast-milk and allowed to stand at ordinary room-temperature for twenty-four hours: then the percentage of cream is read off. Under such conditions the percentage of cream is to that of fat approximately as five to three; thus, 5 per cent. of cream indicates 3 per cent. of fat, etc.

ESTIMATION OF THE PROTEIDS.—So far as the proteids are concerned, it is possible to distinguish only between conditions in which they are very high and very low. The sugar and salts are present in so nearly constant proportions that their variations may be regarded as having practically no effect on the spe-

cific gravity. If, then, the fat is high, and the specific gravity is high, the proteids may be assumed to be in excess; if the fat is low, and the specific gravity low, the proteids may be assumed to be in too small proportions.

[Simple apparatus devised by author for the clinical examination of breast-milk, consists of a lactometer and a graduated tube. The milk to be examined is either the entire specimen at a single nursing or a specimen taken as near the middle of the nursing as possible. The specific gravity is first taken; then the milk is put into the graduated tube up to the 100 line, and allowed to stand for twenty-four hours on the physician's table, at which time the amount of cream which has risen can be read off as hundredths. A good average milk has a specific gravity of about 1030, with about 8 per cent. of cream. Provided the specific gravity and the *percentage* of cream does not vary materially from these figures, it may be inferred that the amount of proteids is normal. L. EMMETT HOLT, Assoc. Ed., Annual, '93.]

BACTERIA.—No germs are found in normal human milk if the skin of the breast has been cleaned and the first drawings have been discarded. Only in case of suppurative disease of the breast or some general microbic disease does the milk in the lobules contain bacteria.

Seventy-six investigations made of milk taken from 73 different breasts of 64 persons. In only 4 cases was there a complete sterility of the milk. In 2 cases the milk from one breast was sterile, while that from the other contained germs. Honigsmann (Zeit. f. Hyg., etc., May 26, '93).

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The milk in the breasts of pregnant women, nursing women, and newborn children in the great majority of cases contains bacteria. With very few exceptions we have to deal with staphylococci alone, and especially with the staphylococcus albus.

The entrance of the bacteria takes place from without from the nipple; entrance by way of the blood-current is, up to this time, not proved without objection. Those germs which find their way into the gland are relatively harmless; they do not injure either the mother or the child. There is no mastitis without micro-organisms. Infection in mastitis results from without by way of the lymphatic vessels through skin injuries, and extends in various ways, dependent upon the kinds of germs which have gained entrance. Koestlin (*Archiv f. Gynäk.*, vol. liii, H. 2, '97).

Conditions which affect the Composition of Breast-milk.

AGE AND CONSTITUTION OF THE NURSE.—The milk of a woman between twenty and thirty-five years is richer in fat than at other ages. Moreover, a robust constitution contributes to an abundant milk-supply; still, many delicate-looking women make good nurses.

DEVELOPMENT OF THE BREASTS.—Breasts rich in glandular elements secrete the best milk. The conical breast which is not very large, and has but little fat, is usually the best form.

Statistics collected at Freiburg Maternity. Out of 525 in childbed, only one-half could suckle thoroughly during the first two weeks; 99 secreted no milk; 49 had imperfect nipples; 46 had fissured nipples; and 44 had insufficient secretion of milk. Only 33 suckled without unfavorable complications. Development of the nipple bore a direct relation to the value of the breast as a secretory organ. Wiedow (*Centralb. f. Gynäk.*; *Brit. Med. Jour.*, Aug. 17, '95).

NUMBER OF CHILDBIRTHS.—This has an influence only in so far as it affects the general health of the woman. The milk is apt, however, to give out earlier with each successive lactation.

ACUTE ILLNESS.—If mild and of short duration, there is no lasting effect; if severe and prolonged, the milk is reduced in quantity, the fat becomes low,

and the proteids often high. In septic and suppurative disease bacteria may be found in the milk.

DIET.—A generous diet increases the fat and the proteids. A nitrogenous diet, consisting largely of meat, milk, eggs, beans, peas, etc., increases the fat more than the proteids; but, if the nurse takes little exercise, there is apt to be an excess in the proteids also. Large quantities of liquid increase the amount of milk; but the percentage of solids is diminished. Malted drinks increase the quantity, and raise the proportion of fat. If the diet is low, the milk becomes scanty, the fat is diminished, and the proteids usually diminished; if increased, they are often changed in character. No matter what the diet, the percentage of sugar remains practically unchanged.

DRUGS.—Only a few drugs are with certainty eliminated by the breast, and these in varying proportions. Alcohol, opium, atropine, chloral, and the iodides may be given off in an amount sufficient to cause symptoms in the nursling; likewise rhubarb, senna, castor-oil, and the saline cathartics. Occasionally the salicylates, copaiba, colchicum, antipyrine, turpentine, iron, and arsenic are eliminated in appreciable quantities. Mercury is excreted only in very small amount, after prolonged administration.

The writer found: 1. That salicylate of sodium greatly increases the secretion of milk, and becomes dangerous to the infant after the administration of 35 grains. 2. Iodide of potassium is not separated from the blood by the lacteals for some time after the commencement of its use, and is present in the milk for more than twenty-four hours after the nurse has ceased taking it; 3 grains may be administered daily without any bad effect upon the child. 3. Ferrocyanide of potassium has negative effects upon the infant even after doses of 30

grains are given. 4. Iodoform passes very readily from the circulation of the mother into that of the infant. 5. There is no direct transmission of the salts of mercury. 6. Moderate doses of morphine, either by the mouth or hypodermically, have little effect upon the nursling. 7. With chloral no effect upon the child was noticed when the breast was withheld for one or two hours, and this even in weak and puny children. 8. Atropine must be used with great care, as it is easily transmitted to the child through the nurse's milk. Fehling (*Med. Press and Circ.*, May 9, '88).

Literature of '96-'97-'98.

Following conclusions reached regarding antipyrine and lactation: 1. Antipyrine certainly passes in a natural state into the milk. 2. Given in large doses, in two capsules, each containing 15 grains, at intervals of 2 hours, it may be detected in the milk in from 5 to 8 hours after its ingestion, and in from 19 to 23 hours afterward it cannot be discovered; elimination, therefore, lasts 18 hours at the maximum. 3. The antipyrine during this time passes into the milk only in an excessively small proportion, very much less than 50 parts in 1000; it is only in exceptional conditions—for instance, when 60 grains are administered in 16 hours—that it perceptibly reaches this proportion. 4. It does not influence in any way the quality of the milk, and particularly the lactose, the casein, or the fat. 5. It seems to have no action at all on the secretion, which always remains very abundant, provided the woman continues to nurse. 6. From the absence of general symptoms and from examinations of the weight, the infinitesimal quantity absorbed by the nursling does not seem to have any unfavorable action. M. G. Fieux (*Bull. Méd.*, Sept. 5, '97).

EXERCISE.—The quantity of the milk is usually increased, and the proteids diminished by moderate exercise.

NERVOUS AND EMOTIONAL DISTURBANCES.—There are few influences that affect the milk so immediately and so

strikingly as nervous impressions. Grief, anger, fright, passion, great excitement, and fatigue are apt to have a prompt and decidedly bad effect; so that the infant may be actually poisoned, and have an attack of severe acute indigestion, which may be accompanied by convulsions. The change in the milk is probably in the proteids, toxic nitrogenous bodies being formed.

MENSTRUATION.—Comparatively few infants are very much affected by the return of menstruation. The quantity of the milk is often diminished for the first day or two of the menstrual period.

Menstruation, either before or after the sixth week, can have no deleterious effect on the offspring. Schlieter (*Med. Press and Circ.*, Feb. 10, '92).

PREGNANCY.—If pregnancy supervenes, the milk deteriorates steadily in quantity and quality.

Nursing.

“Will the mother be able to nurse the baby?” is a question the physician must frequently answer nowadays when an infant is born. No matter what the explanation, it is a fact that each year there are fewer women that can nurse their babies. In some conditions nursing is either impossible or inadvisable; in others the question can be answered only after a trial.

CONDITIONS IN WHICH NURSING SHOULD NOT BE ATTEMPTED.—1. If there is no milk secreted.

2. If tuberculosis is present in any form.

3. If there is malignant disease of the breast, or if there have been serious complications of parturition, as hæmorrhage, eclampsia, nephritis, or septicæmia.

4. The presence of chorea, epilepsy, or insanity precludes nursing.

In the above-mentioned conditions

nursing is deleterious to both the mother and the child.

CONDITIONS IN WHICH NURSING IS NOT LIKELY TO BE SUCCESSFUL.—1. If, on previous occasions, under favorable conditions the mother has been unable to nurse.

2. When the woman is of a very delicate constitution and highly nervous.

If nursing is attempted in these circumstances, the baby's weight and general condition should be carefully watched. The usual custom is to continue nursing as long as the infant thrives, but the mother's condition should be watched with equal solicitude, lest she be injured by continuing the nursing too long.

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Case of healthy young woman, temperate, and exposed to no unhealthy external conditions, who had been three times pregnant, and always carried her child to term. None of the three children could be suckled, as severe vomiting set in whenever it took the breast. No medicine checked the gastric irritation. All other infants put to breast by same patient were at once attacked with vomiting. Examination of the milk showed that it contained a great excess of albumins, especially lactalbumin and lactoprotein. Babeau (*Jour. de Méd. et de Chir. Prat.*, Aug. 10, '97).

Care of the Nursing Woman.

DIET AND MODE OF LIFE.—The nursing woman should have a generous mixed diet, not excessive in nitrogenous food nor in vegetables. She should drink from a quart to a quart and a half of milk or milk-gruels daily. Meat, eggs; such cereals as oatmeal, rice, hominy, etc., bread, potatoes, all the common vegetables, and fresh fruits are allowed. Very highly seasoned foods, salads, cabbage, tomatoes, stale or unripe fruits, alcoholic drinks, strong tea, and coffee

are forbidden. Whatever disturbs digestion is apt to produce a bad effect upon the milk, and should therefore be avoided.

The mode of life should be simple, with regular exercise,—by driving, early; or by walking, later, as soon as returning strength will permit. There should be no anxieties nor great excitement.

BREASTS AND NIPPLES.—At least a fortnight before confinement the nipples should be examined, and, if flat or depressed, they should be drawn out and the woman instructed to do this herself several times a day. If the nipples are hard, borated vaselin or lanolin should be rubbed on them four or five times daily; if soft and macerated, they should be painted three times a day with equal parts of 50-per-cent. alcohol and glycerin.

During the whole of lactation the nipple should be cleansed with 2-per-cent.-boric-acid solution before and after nursing, and the breasts supported in a well-fitting corset. Slight excoriations are well treated by dusting them freely after each nursing with bismuth subnitrate; for fissures probably the best treatment is to paint with an 8-per-cent.-nitrate-of-silver solution once or twice a day, and either to use a nipple-shield or stop nursing for a time from the affected breast. It may be necessary to use nipple-shields because of the small size of the nipples, as well as because of fissures.

Nursing Rules for Healthy Infants.

Regular hours are very important, and should be adhered to from the beginning. This practice will do much to establish regular habits of sleep and regular movements of the bowels. If the child is asleep at the nursing-time it should be awakened. From the outset, moreover, the infant should take

boiled water from a bottle at least once a day, not only for the water, but also to learn to use the rubber nipple.

It is generally not necessary to put the child to the breast until three or four hours after the birth; and even then it should be allowed to nurse only about five minutes. Aside from the fact that the breasts contain little milk until the third day, the nipples should be gradually accustomed to their function. After the second day the child may nurse from ten to twenty minutes.

The number of nursings a healthy infant should have in twenty-four hours, together with the intervals and the number of night-nursings, is given in the subjoined table.

A loss in weight during the first three or four days is normal, and amounts to about one-tenth of the infant's birth-weight. After about a week the regular gain for the first five months should be about six ounces per week; from the sixth month to the end of the first year there should be an average gain of from three-quarters of a pound to a pound per month. At five months the average healthy infant should have doubled its birth-weight, and at one year should have trebled it. It is to be noted that the gain during the second six months is more apt to be irregular, due to dentition, end of lactation, etc.

Not only should the child gain in weight, but the flesh should be firm,

SCHEDULE FOR BREAST-FEEDING.

AGE.	NUMBER OF NURSINGS IN 24 HOURS.	INTERVALS DURING DAY.	NIGHT-NURSINGS, BE- TWEEN 9 P.M. AND 7 A.M.
First day	4	6 hours	1
Second day	6	4 hours	1
Third to twenty-eighth day	10	2 hours	2
Fourth to thirteenth week	8	2½ hours	1
Third to fifth month	7	3 hours	1
Fifth to twelfth month	6	3 hours	0

During the first few days of life, if the infant seems unsatisfied, the nursings may be supplemented by giving from 1 to 1 1/2 ounces of warm, sterile, 5-per-cent-milk-sugar solution; this is made by dissolving an even tablespoonful of milk-sugar in 7 1/2 ounces of boiling water, and may be given from the bottle. It will frequently prevent the marked loss of weight and "inanition-fever" which often occur when the breast-milk is scanty.

Signs of Successful Nursing.

The following are the important features to be considered:—

WEIGHT.—All infants should be weighed once a week, and feeble infants twice a week during the first six months.

and the cheeks, ears, and lips of good color.

LENGTH OF TIME AND MANNER OF NURSING.—The infant should always be ready to nurse at the proper time, but not overgreedy; and it should be satisfied after nursing ten, or at most twenty, minutes. Satisfaction is shown by relinquishing the breast voluntarily, and then either falling asleep or remaining contented and happy while awake.

VOMITING.—There should be no true vomiting; but there may be regurgitation of small quantities of milk almost immediately after nursing,—due usually to overdistension of the stomach.

STOOLS.—There should be from one to three easy, natural movements daily;

soft, smooth, and free from curds. After the disappearance of the meconium, about the fifth day, their color should be orange-yellow or yellow. Normally the reaction is acid.

SLEEP AND DISPOSITION.—During the first few weeks infants should sleep nearly all the time they are not nursing; at six months considerably more than half the time; and from then on until a year old they should take both a morning and an afternoon nap.

It is normal for a baby to cry for fifteen to thirty minutes daily; but fretfulness, peevishness, and sleeplessness, with the crying which accompanies them, are abnormal.

DEVELOPMENT.—With successful nursing there should be the signs of normal healthy development. In the muscles this is shown by the child's holding up its head at the fourth month or earlier, sitting with the back unsupported at the eighth month or earlier, standing by the ninth month, and beginning to take steps by the end of the first year.

DENTITION should be regular, the lower central incisors appearing before the ninth month, and the upper incisors before the end of the year.

Signs of Unsuccessful Nursing.

TEMPERATURE.—During the first four or five days the most important sign of insufficient food is a rise of temperature: "inanition-fever," so called. The range may be from 101° to 102° , or in extreme cases from 104° to 106° . If no obvious symptoms of illness are present, such a temperature before the fifth day may be regarded as due to inadequate nursing.

[For further discussion of inanition-fever in the newborn one may refer to the articles by L. Emmett Holt in *Archives of Pediatrics*, vol. xii, p. 561; and by Floyd M. Crandall, in *Archives of Pediatrics*, vol. xvi, p. 174.]

WEIGHT.—Failure to make the proper gain, if not accounted for by existent disease, is nearly always due to inadequate nourishment.

LENGTH OF TIME AND MANNER OF NURSING.—If the infant habitually remains at the breast for more than twenty minutes; or if, after taking the breast with avidity, it soon turns away fretting, only to resume in a minute or so, and finally gives it up disgusted and crying, the milk is probably too scanty. Sometimes the same thing is indicated by the baby's refusing to take the breast. On no account should such an infant be pacified by letting it sleep on the breast or by giving it a rubber nipple.

VOMITING.—A few infants thrive, in spite of considerable regurgitation. But, if the vomiting is between feedings and habitual, the sign is important.

COLIC.—If only occasional, colic does not mean much, even though severe; but the baby that has continual discomfort, with more or less flatulence, is not getting the proper kind of milk.

STOOLS.—That the nursing is improper may be shown either by constipation, with dry, light-colored or greenish stools of foul odor, or by diarrhoea, with thin yellow or green stools, four to ten a day, which contain curds and, after a time, mucus.

SLEEP AND DISPOSITION.—Sleeplessness, restlessness, and fretfulness are generally due to either hunger or indigestion.

DURING THE LATTER PART OF LACTATION the signs of inadequate nursing, in addition to those already given, are: stationary weight or actual loss, delayed dentition, delayed closure of the fontanelle, flabby muscles with inability to sit or stand at the proper age, and anæmia. There may be also symptoms of malnutrition or of incipient rickets.

The presence of all or of any one of these symptoms is enough to arouse suspicion, and the physician must determine whether the quantity or the quality of the breast-milk is at fault or both. This can be made out by the method already described, and then the proper treatment instituted as indicated below.

Chemical examination of two hundred specimens of human breast-milk shows that: 1. Excessive fats or proteids may cause gastro-intestinal symptoms in the nursing infant. 2. Excessive fats may be reduced by diminishing the nitrogenous elements in the mother's diet. 3. Excessive proteids may be reduced by a proper amount of exercise. 4. Excessive proteids are especially apt to cause gastro-intestinal symptoms during the colostrum-period. 5. The proteids, being higher during the colostrum-period of premature confinement, present danger to the untimely-born infant. 6. Deterioration in human milk is marked by a reduction in the proteids and total solids, or in the proteids alone. 7. This deterioration takes place normally during the later months of lactation, and, unless proper additions are made to the infant's diet, is accompanied by a loss of weight, or the child's gain is below the normal standard. 8. When this deterioration occurs earlier it may be the forerunner of the cessation of lactation, but well-directed treatment may improve the condition of the milk. Adriance (*Archives of Ped.*, vol. xiv, No. 2).

Means of Improving Breast-milk when Nurslings are not Thriving.

WHEN THE MILK IS POOR an important consideration is whether this quality is due to a temporary or accidental cause—as severe labor or one of the complications of labor—or to a constitutional cause. In the former case much may be done; in the latter, almost nothing. If the milk is poor and scanty, the woman's general condition should be improved by giving a diet consisting largely of meat, milk, gruels, and liquids in abundance; a good extract of malt may

be added. Out-of-door exercise, plenty of sleep, and freedom from anxiety are especially important. Gentle local massage often gives gratifying results; but it is imperative that the breasts and the hands of the operator be scrupulously cleansed before the manipulations are begun. (See AGALACTIA, volume i.)

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Somatose, used in one hundred and fifty cases, restored or increased the mammary secretion. Drews (*Ther. Woch.*, No. 45, '97).

Somatose given with good result to two women whose milk had failed, owing to premature menstruation. Lutaud (*Jour. de Méd. de Paris*, No. 15, '97).

Fifteen cases in which somatose was given for failing lactation. Besides improving general health, somatose acts specifically on the mammary secretion. Joachim (*Centralb. f. Inn. Med.*, Mar. 12, '98).

Case of patient, who was much debilitated after pregnancy, owing to a typhoid pneumonia, and had entirely lost her secretion of milk. Somatose was given thrice daily, for a period of six weeks. The preparation, unlike the other food, was not vomited, but well tolerated; the appetite soon increased, as well as the bodily weight and the almost arrested mammary secretion. Fuchs (*Die Heilkunde*, No. 8, '98).

WHEN THE MILK IS EXCESSIVELY RICH, AND THE QUANTITY ABUNDANT, a reduction in the amount of meat, and the abstention from malted or alcoholic drinks, with active out-door exercise, will usually reduce the ingredients to the standard. This condition of the milk frequently obtains with wet-nurses.

To conclude, if the milk is very rich, the proportions can usually be reduced, by careful observation of the measures recommended, to a point where the infant is able to digest it. If the milk is poor and scanty there is less probability of success. In either case, *if, after two*

or three weeks' trial, the milk has not improved, and the child continues to suffer from indigestion, it is better to wean at once, or secure another nurse, rather than persist longer in the attempt.

Wet-nursing.

In the majority of cases artificial feeding is to be preferred to wet-nursing, but in some cases the latter is a necessity. To secure a good wet-nurse is difficult, and there is no certainty that her milk will agree with the foster-child. The ideal wet-nurse is a healthy, young, unmarried primipara that lost her infant shortly after birth; she should be phlegmatic in temperament, and of sufficient intelligence to nurse the baby regularly. The actual wet-nurse in this country is usually a buxom married multipara whose baby and home-cares keep her constantly dissatisfied with her temporary occupation. One may approximate the ideal by selecting a healthy woman between twenty and thirty, not necessarily a primipara, who has a thriving infant. Women with syphilis, tuberculosis, chorea, or epilepsy should be excluded, both by their history and by examination of the hair, throat, skin, lymph-nodes, and chest. The breasts should be well-developed glands that become hard with milk within three hours after a nursing; the nipples should be of good size, well formed, and free from fissures.

The wet-nurse's child should, of course, be carefully examined. In regard to the age of the child, it need not correspond very closely to that of the foster-child. In general, the milk should not be more than six weeks old for a child of one to three weeks: if the foster-child is over six weeks, the milk may be from one to four months old.

An important caution is to see that the nurse is not overfed, and that she

takes regular active out-of-door exercise; otherwise the milk is apt to become too rich.

Weaning and Mixed Feeding.

With few women among the better classes can nursing be continued beyond the ninth, and generally not beyond the sixth or seventh month, without exhausting the mother or partially starving the child.

Literature of '96-'97-'98.

Causes which would make weaning necessary during the first nine or ten months of life are: 1. Pregnancy. 2. Acute or chronic disease of a serious nature. 3. Mastitis of both breasts. On no account must a child be allowed to drink milk containing pus. 4. Continuous and progressive loss of weight for several weeks. W. J. Greig (Can. Pract., Aug., '98).

WHEN SHOULD WEANING BE BEGUN?
—Stationary weight or actual loss, the child being otherwise well, means insufficient food. After the sixth or seventh month this indicates weaning. Before the sixth month the attempt may be made to improve the milk by the means already suggested, using in the meantime supplemental bottle-feedings two or three times a day. If the milk does not become normal in amount, it may still satisfy the infant at three or four nursings daily, the bottle being given in place of the other nursings. This method of "mixed feeding" may be profitably continued as long as the child thrives: it is much better for the child than complete weaning. If the nurse cannot satisfy the baby at least twice a day, the child had best be weaned. Speaking generally, weaning should be begun at the ninth or tenth month; but even then the weekly weighing is the safest guide.

METHOD OF WEANING.—At whatever

time begun, the process should be gradual, if possible, lest the mother have trouble with her breasts, and the child with its stomach and bowels. At first a bottle should be given twice a day: if the food causes no indigestion the number of feedings and the quantity may be gradually increased up to the full quota for the child's age, according to the table below, under "Modification of Milk for Healthy Infants During the First Year," page 227.

As to the formulæ to be used, if the baby is under four months old, the food for the first few days should be as weak as that for a newborn child; if from four to nine months, the formula should be at first that for a month-old child; and, if from nine to twelve months, that for a three-month child.* The important point is always to start with a sufficient quantity of very dilute food, and afterward increase the proportions as rapidly as the child can assimilate them.

young infants of substances not present in breast-milk (*e.g.*, starch) is rarely advisable, and if used in large quantity may be positively harmful.

In accordance with these principles, cows' milk is selected, because it furnishes the elements required, although not in the proportions best suited to the infant's needs.

In artificial feeding cows' milk may be dangerous (1) through the food given to the animal; (2) by the substances which are added to it; (3) by infection springing from a diseased cow; (4) by secondary infection. Hence the advisability of giving the mixed milk from the entire dairy, and not one cow's milk. Verrier (*La France Méd. et Paris Méd.*, Oct. 7, '92).

Cows' Milk.

DIFFERENCES BETWEEN COWS' MILK AND BREAST-MILK.—The composition of good breast-milk and cows' milk are given in the table:—

CONSTITUENTS.	WOMAN'S MILK, AVERAGE.	COWS' MILK, AVERAGE.
Fat	4.00 per cent.	3.50 per cent.
Sugar	7.00 per cent.	4.30 per cent.
Proteids	1.25 per cent.	3.75 per cent.
Salts	0.20 per cent.	0.70 per cent.
Water	87.55 per cent.	87.75 per cent.

Artificial, or Substitute, Feeding.

In order that an infant may properly thrive on an artificial food, certain fundamental principles must be complied with, viz.:—

1. The food must contain the same ingredients as breast-milk, and in about the same proportions.
2. As nearly as possible the fats, sugar, and proteids of the food should resemble those of breast-milk, both in chemical composition and in their behavior to the digestive fluids.
3. The addition to the food of very

It appears, therefore, that cows' milk contains a large excess of proteids and of salts, but too little sugar; the fat is present in about the same proportion in both. Moreover, cows' milk is acid in reaction and contains numerous bacteria.

FAT.—The average amount of the fat of cows' milk which a healthy infant can digest varies from 2.0 to 4.5 per cent. Beginning with 1.5 per cent., or lower, in the early days of life, the amount may be increased to 3.0 per cent.

at one month, and 4.0 per cent. at five or six months.

SUGAR.—The sugar in both kinds of milk is simply lactose in solution; but the proportion in cows' milk is only about two-thirds that in breast-milk.

PROTEIDS.—The proteids show the greatest differences, both in quantity and in character. A good average breast-milk contains nearly 1.5 per cent. of proteids, of which about one-third is casein, and the other two-thirds the soluble and easily digestible lactalbumin. Cows' milk contains nearly 4.0 per cent. of proteids, of which four-fifths is the insoluble and difficultly-digestible casein, while only about one-fifth is lactalbumin. Stated in another way, breast-milk contains about 1.0 per cent. lactalbumin, and 0.5 per cent. of casein, while cows' milk contains only about 0.8 per cent. of lactalbumin, but 3.2 per cent. of casein. On account of the relative indigestibility of the proteids of cows' milk, lower percentages have to be used than those in breast-milk, especially for the first two or three months. During the first few days infants can rarely digest a higher proportion of the proteids of cows' milk than 0.5 per cent.; by the end of the first month the average child can take 1.0 per cent., by the fourth month nearly 1.5 per cent., and by the sixth month 2.0 per cent.

Literature of '96-'97-'98.

It is doubtful if cows' milk can be modified so as to make it exactly resemble mothers' milk, for the proteids of the former differ unquestionably from those of the latter, both in quality and in quantity. The undoubted advantage, however, is that in the milk-laboratory the percentage composition of the cows' milk can be altered to suit the idiosyncrasies of the infant's digestion, while we have far less control over the percentage-composition of the breast-milk of the

mother or wet-nurse. Henry Ashby (Med. Chronicle, Aug., '97).

INORGANIC SALTS.—The salts are about three and a half times more abundant in cows' milk.

Proportion of iron very similar in human and in cows' milk; slight excess of the oxide in latter. Anselm (Centralb. f. klin. Med., Sept. 7, '95).

REACTION.—The reaction of cows' milk is acid, while that of human milk is generally alkaline, rarely neutral.

Breast-milk is alkaline. Any substitute must therefore be alkaline; cows fed on blue grass and on sugar-beets yield alkaline milk. Rotch (Archives of Ped., May, '95).

BACTERIA.—Breast-milk is practically sterile, while cows' milk always contains germs, some of which may be pathogenic. A large proportion of diarrhoeal diseases are believed to depend upon the saprophytic bacteria; and typhoid, cholera, diphtheria, tuberculosis, and scarlatina may be transmitted by cows' milk.

Literature of '96-'97-'98.

Careful comparative analytical study made of a number of the most widely known manufactured infant-foods, standardizing their products as prepared for the nursing-bottle in accordance with directions for infants of 6 months, and these are compared with the analysis of mothers' milk, according to Leeds. The results are shown in the table given on the following page.

If mothers' milk is to be accepted as the standard, it will be seen from the table that cows' milk, modified by the addition of water, cream, and peptogenic milk-powder, offers a product containing to the full extent all of the proximate principles present in human milk and wholly free from extraneous admixtures. R. H. Chittenden (N. Y. Med. Jour., July 18, '96).

MODIFICATION OF COWS' MILK.—Because of the differences noted above be-

tween breast-milk and cows' milk, certain modifications must be made to adapt cows' milk to the digestion of the average infant.

Proteids.—Most important is a reduction in the proportion of the proteids. This can be effected by simply diluting the milk.

Sugar.—Sufficient sugar must be added to bring the proportion in the food up to between 5 and 7 per cent. Good milk-sugar is preferable in the great majority of cases, but where it is not obtainable, or where it causes indigestion, granulated sugar may be used,

specially rich milk used, in order to have the fat in proper amount.

Inorganic Salts.—The excess of salts in cows' milk is about the same as that of the proteids; so that to the dilution required for the proteids will reduce the salts to about the proper proportion.

Milk is especially deficient in iron, while wheat contains nearly three times the quantity. An exclusive diet of milk for children, especially anæmic children, cannot be regarded as the best practice. Editorial (*Modern Med.*, June, '95).

Food composed of wheat and other cereals richly supplied with iron may be added to the cows' milk, thus supplying

	MOTHERS' MILK.	MALTED MILK.	NESTLE'S MILK-FOOD.	IMPERIAL GRANUM.	MELLIN'S FOOD.	PEPTOGENIC MILK-POWDER.
Specific gravity	1031.00	1025.00	1024.00	1025.00	1031.00	1032.00
Water	86.73	92.47	92.76	91.53	88.00	86.03
Total solid matter (by direct determination)	13.26	7.43	7.24	8.47	12.00	13.97
Inorganic salts	0.20	0.29	0.13	0.34	0.47	0.26
Total albuminoids	2.00	1.15	0.81	2.15	2.62	2.09
Soluble albuminoids	2.00	1.15	0.36	1.67	2.62	2.09
Insoluble albuminoids		trace	0.45	0.48		
Fat	4.13	0.68	0.36	1.54	2.89	4.38
Milk-sugar	6.93	1.18	0.84	2.71	3.25	7.26
Cane-sugar			2.57			
Maltose		3.28	trace	trace	2.20	
Dextrin		0.92			0.53	
Soluble starch			0.44	0.58		
Starch			1.99	1.22		
Reaction	alkaline	alkaline	alkaline	alkaline	alkaline	alkaline

and with many infants answers quite as well. The quantity of cane-sugar used, however, should be only about half the amount of milk-sugar required, because, if added in full quantity, it makes the food too sweet.

Literature of '96-'97-'98.

When it is merely a question of sweetening the food of infants, saccharin is the most suitable form of sugar. Keller (*Centralb. f. Inn. Med.*, Aug. 6, '98).

Fat.—Diluting the milk to reduce the proteids diminishes the proportion of fat also; so that cream must be added, or

the deficiency. Just (*Practical Med.*, Aug., '95).

Reaction.—The acidity of cows' milk may be overcome by adding 1 ounce of lime-water for each 20 ounces of the food, or by adding about 1 grain of bicarbonate of soda for each ounce of the food. The soda is preferable where there is constipation.

One reason why cows' milk is not easily digested by infants is that the casein formed by the action of the curdling ferment of the gastric juice is dense and tough, while that formed from human milk is flaky. The addition of lime-water to cows' milk causes it to be pre-

cipitated in flakes also, and thus overcomes this disadvantage to a great extent. A tablespoonful of lime-water to an ordinary bottle of milk is enough, and a little sugar of milk may be added to correct the taste of the lime-water. *Courant* (*Revue de Thér. Médico-chir.*, July 1, '92).

Sterilization and Pasteurization of Milk.

The purposes of "sterilizing" milk are: 1. The destruction of pathogenic bacteria which may have gained entrance. These are the germs of typhoid, diphtheria, cholera, tuberculosis, and those which produce diarrhoeal diseases. The milk may receive this contamination from disease in the cow, from the milk-er's hands, or from the water in which the pails, cans, and jars are washed. The close connection which exists between the diarrhoeal diseases of summer and a contaminated milk-supply must never be lost sight of. The fact that these pathogenic germs are so frequently present, together with the fact that milk in cities is twenty-four to forty-eight hours old, and must often be kept without ice, makes some means of destroying the germs desirable or imperative.

2. The destruction of the ordinary germs of lactic-acid fermentation is desirable in order that the milk may be kept safely for a longer time.

"STERILIZING" THE MILK AT A HIGH TEMPERATURE is the method first proposed for destroying the germs. This so-called "sterilization" means heating it to a temperature of 212° for sixty to ninety minutes. This kills all the germs not in spore form, and such milk will keep for a week at ordinary room-temperatures.

In milk which is supposed to be sterilized there can always be found certain species of aërobic bacteria, which possess peptonizing properties. Five varie-

ties of *bacillus lactis peptonans* isolated resembling the bacilli of Flüggé and Bujwid. Expensive methods have no advantage over boiling in an ordinary clean vessel. After being boiled, milk should be kept at a temperature under 60.8° F. Sterlong (*Provincial Med. Jour.*, July 1, '95).

Simple filtration of milk through a half-inch layer of compressed absorbent cotton is an efficient means of removing a very large proportion of the contained bacteria; at the same time the amount of cream is not altered, the amount of fat remains the same, and the specific gravity of the milk is not changed. In sterilized milk (forty minutes), after four days' culture, unfiltered specimens showed 56,000 colonies on the average, while the filtered ones held but from 300 to 800 durable germs to the cubic centimetre. Seibert (*Arch. of Ped.*, July, '94).

Literature of '96-'97-'98.

Complete sterilization of milk is not accomplished in less than 1½ to 2 hours at a temperature of 212° F. reckoned from the moment when this temperature is attained. Troitzky (*Arch. f. Kinderh.*, B. 19, S. 97).

STERILIZING AT A LOW TEMPERATURE, OR PASTEURIZATION, is the second and preferable method. By pasteurizing is meant heating the milk for half an hour or more at a temperature of from 155° to 170°. This is sufficient to destroy the pathogenic germs, though not their spores; such milk will keep on ice for only two or three days.

Pasteurizing for thirty minutes at 158° F. destroys bacilli of tuberculosis, diphtheria, typhoid, and cholera, but does not kill the bacteria which cause milk to spoil. Temperature of 200° F. destroys all lactic-acid bacteria. Partially sterilized milk must be kept below 65° F. or consumed within twelve hours. Flüggé (*N. Y. Med. Jour.*, Dec. 1, '94).

Milk to be subjected to a temperature of 155° F. for half an hour and should be used within twenty-four hours.

Bureau of Animal Industry, Washington (Coll. and Clin. Rec., Mar., '95).

[Freeman's pasteurizer is the simplest apparatus for sterilizing at low temperatures. It may be obtained from most large drug-stores, or from James Dougherty, No. 411 West Fifty-ninth Street, New York City. L. EMMETT HOLT and L. E. LA FETRA.]

High-temperature sterilization would seem to be the ideal method; but it is open to certain objections. In the first place it changes the taste to that of boiled milk, which many children do not like. It renders the milk constipating and the casein more difficult of digestion. Furthermore, the nutritive properties of the milk are somewhat impaired; for it appears now beyond dispute that the use of sterilized milk as the sole diet for a long time is not infrequently followed by the production of scurvy.

Pasteurization of milk at about 167° F. affords a safeguard against the deleterious effects of any bacteria which it may contain, without interfering with its nutritive qualities. R. G. Freeman (Diet. and Hyg. Gaz., Oct., '93).

There is reason for supposing that when fresh milk is ingested the living cells are at once absorbed without any process of digestion, and enter the bloodstream and are utilized in building up the tissues. The casein of the milk is digested in the usual way of other albuminoids by the gastric juice, and absorbed as peptone. There is also absorption of serum-albumin by osmosis.

The chemical result of boiling milk is to kill all the living cells, and to coagulate all the albuminoid constituents.

There is a very distinctly appreciable lowered vitality in infants which are fed on boiled milk. The process of absorption is more delayed, and the quantity of milk required is distinctly larger for the same amount of growth and nourishment of the child than is the case when fresh milk is used. J. L. Kerr (Brit. Med. Jour., Dec. 14, '95).

Literature of '96-'97-'98.

Comparatively or temporarily sterilized milk may be administered for any length of time without fear, but sterilized milk that is put into hermetically-sealed vessels, and which can thus keep fresh for several or many days, will produce scurvy unless some fresh food is administered daily. One meal of fresh whey daily will achieve this in younger infants than those who may have fresh vegetables, meat, or fruit. J. K. Barton (Brit. Med. Jour., Jan. 2, '97).

Pasteurization does not change the taste nor make the milk constipating, nor does it render the casein less digestible. Whether pasteurizing the milk changes it so that scurvy may result is not determined; certainly the danger is so slight that it may be disregarded.

Pasteurization is recommended in all cases during the warm months. Sterilization is advised only for use among the very poor, in cities during very hot weather, in any place where ice is not obtainable, and for transportation on long journeys. In cool weather, with a fresh, clean milk-supply and plenty of ice, neither method is necessary.

Investigation of the milk-supply of New York City shows that both in winter and summer the ordinary commercial milk upon its arrival in the city is within the incubation-period, this stage lasting 24 hours in winter, 13 to 17 hours on a fairly cool day, and 5 hours on a hot summer day, after reaching the city. This milk is therefore considered fit for infant-feeding, if prepared early in the day. On a warm summer day pasteurized milk had a fairly stationary acidity for from 10 to 12 hours, the acidity then rising slowly until at the end of 24 hours the milk was curdled. The growth of the bacterium *lactis* was thus retarded about 6 hours as compared with unpasteurized milk. On the other hand, sterilization at from 90° to 92° C. for 40 minutes, while making the milk far from absolutely sterile, rendered the bacterium

lactis inert for 2 days at least, at a summer temperature. It may therefore be concluded that without subsequent refrigeration pasteurization in summer does not offer a safe means of preparing milk for infant-feeding. Emily Lewi (N. Y. Med. Jour., Feb. 9, '95).

Literature of '96-'97-'98.

Since using pasteurized milk, the death-rate from diarrhoeal diseases in Brooklyn has been lower in 1896 and 1897 than it had ever been. George P. West (San. Record, Nov. 26, '97).

While neither sterilization nor pasteurization renders the milk more digestible, so many dangers of gastro-intestinal infection are removed by their use that they are to be regarded as valuable safeguards.

Literature of '96-'97-'98.

Number of cases of mild milk-infection noted occurring among children fed upon

milk. Milk should be heated to a temperature of at least 194° to 198° or 212° F. for ten minutes. It should be rapidly cooled and kept below 20° C. till ready for use. Koplik (Med. Rec., Feb. 19, '98).

Modification of Milk for Healthy Infants during the First Year.

Not all infants, even those who are healthy, can be fed in the same way. The problem, therefore, is to make a food in which the quantity of each ingredient—fat, sugar, and proteid—shall be known, and in which, also, these quantities can be separately varied so as to suit the individual child. At present the percentage method has come to be generally used by those who have had the greatest experience in the feeding of infants.

The following table may be taken as a general guide for feeding a healthy in-

AGE.	FAT.	SUGAR.	PROTEIDS.	DAILY QUANTITY.
First day		5.00 per cent.		4 to 8 ounces
Second, third, and fourth days	1.00 per cent.	4.00 per cent.	0.33 per cent.	8 to 12 ounces
Fifth, sixth, and seventh days	1.50 per cent.	5.00 per cent.	0.50 per cent.	10 to 15 ounces
Second and third weeks	2.00 per cent.	6.00 per cent.	0.60 per cent.	18 to 30 ounces
Fourth week	2.50 per cent.	6.00 per cent.	0.80 per cent.	20 to 32 ounces
Second and third months	3.00 per cent.	6.00 per cent.	1.00 per cent.	22 to 36 ounces
Fourth month	3.50 per cent.	7.00 per cent.	1.25 per cent.	28 to 38 ounces
Fifth month	3.75 per cent.	7.00 per cent.	1.50 per cent.	32 to 38 ounces
Sixth to ninth month	4.00 per cent.	7.00 per cent.	2.00 per cent.	34 to 42 ounces
Tenth to twelfth month	4.00 per cent.	6.00 per cent.	2.50 per cent.	38 to 45 ounces

pasteurized milk or milk-mixtures. The symptoms are sometimes insidious; sometimes marked and troublesome. In some cases there will be first a looseness of the bowels; the movements suddenly increasing to 5 or 7 per day, and are curdy and acid. There may be some fever. In other cases the green acid stools will disappear after a dose of castor-oil. Again, several normal stools may be followed by a semifluid, extremely-acid stool and the child be very weak, or there may be simply no gain in weight and rather fluid stools. All these cases improve rapidly under a change from pasteurized to sterilized

fant of average weight by the percentage method. The schedule shows the percentage of fat, sugar, and proteids, and the daily quantity.

Literature of '96-'97-'98.

During the first month of life an average infant requires about ten feedings of from 1 to 2 ounces daily. During the second and third months from 2 to 4 ounces, and so on. As the amount is increased the number of feedings must be reduced and the interval between each lengthened.

An average formula for a healthy in-

fant during the first week of life would be: fat, 2.0; sugar, 6.0; proteid, 0.6. The percentage may then be gradually increased to reach: fat, 3.0; sugar, 6.0; proteid, 1.0, by the end of the first month. By the third month a healthy infant thrives well on a mixture such as: fat, 4.0; sugar, 7.0; proteid, 1.5.

As a rule, those of largest experience find they get the best results from rather low-percentage mixtures. D. J. Evans (*Montreal Med. Jour.*, Oct., '97).

The percentages recommended by Rotch in the case of children premature at the twenty-eighth week are as follows:—

Proteid, 0.5 per cent.; fat, 1.0 per cent.; sugar, 3.0 per cent.; 24 meals each of 1 drachm; heat to 167° F. and make slightly alkaline.

These amounts can be gradually increased until at the thirty-sixth week the child will be taking such a mixture as this: proteid, 1.0 per cent.; fat, 2.0 per cent.; sugar, 5.5 per cent.; and, if it thrives, further additions can be made until the composition resembles that of good human milk.

If modified milk be not obtainable, the child must be fed upon humanized milk, if necessary diluted, or condensed milk sufficiently diluted, or a mixture of boiled cows' milk, water, and cream, in the proportion of about 1 part of milk to 4 of water, with $\frac{1}{2}$ teaspoonful of cream to the ounce, if it can be obtained fresh and good.

Very premature children must at first be fed every hour, and not more than 1 to 2 drachms must be given at a time. The amount of food given and the intervals between the meals must be very gradually and carefully increased. If the child be very feeble, brandy may be given, about 5 drops every two hours, repeated as often as may be necessary, and if it at any time become markedly cyanotic, oxygen gas should be administered. It may be given from five to ten minutes two or three or more times a day. G. F. Blacker (*Practitioner*, July, '98).

Five deaths among forty-two children suckled on the various samples of milk

submitted to analysis. In each of the fatal cases, with one exception, the percentage of proteids was high, ranging from 2.05 to 4.02. In every case but three of the whole number in which the proteids exceeded 2.5 per cent. the milk disagreed. Variations in the percentage of the other ingredients seem to be much more readily borne. The composition of milk which agrees with the infants is as follows:—

WATER.	FAT.	SUGAR.	PROTEIDS.	ASH.	REFRACTIVE INDEX OF FAT.
88.12	3.11	6.70	1.83	0.24	51.9°

Sheridan Delepine (*Brit. Med. Jour.*, Jan. 22, '98).

MILK - LABORATORIES. — There have been established in Boston, New York, Philadelphia, and several other cities laboratories where it is possible to obtain milk in which the separate ingredients are present in definite percentages. These Walker-Gordon laboratories perform the same service in the preparation of milk that the apothecary does in the dispensing of drugs. They put up what is technically known as "modified milk" according to prescription, and will further sterilize or pasteurize the food if desired. In ordering the milk, the physician simply specifies the percentages of fat, sugar, and proteids which he wishes his patient to have, together with the quantity for each feeding and the number of feedings in twenty-four hours; also the amount of lime-water, and whether the food is to be sterilized, pasteurized, or delivered raw. The laboratory company sends each day's supply every morning, delivering the food in the bottles from which it is to be fed. The advantages of the laboratory method are many, as the physician can vary the proportions from day to day, and feel sure that his directions are carried out.

The only objections are the expense and the fact that these laboratories are as yet established in only the larger cities.

HOME-MODIFICATION OF MILK.—Various methods have been suggested for home-modification, all somewhat complex. At present it cannot be said that the ideal method has been devised. All are only approximate in their results, but they are highly satisfactory, if the details are carefully carried out.

[Dr. W. L. Baner, in the *New York Medical Journal* of March 12, '98, gives some simple equations by the use of which the amount of each ingredient for all the ordinary formulæ may be readily calculated.

Ten-per-cent. cream used to make up a 20-ounce mixture; hence each ounce of the cream adds 0.5 per cent. of fat, 0.2 per cent. of sugar, and 0.2 per cent. of proteid.

The method is an easy one for formulæ in which the percentages are multiples of the above.

A simple device for making up the ordinary formulæ is the "Materna" Milk-Modifying Apparatus. It is a glass graduate with the sides divided into several panels, and with marks indicating the level to which the vessel should be filled with the various ingredients to obtain the formula noted at the top of the panel. Although the method is not very accurate, it has simplicity to recommend it. The apparatus is made by the Surgical & Chemical Supply Co., No. 147 Centre Street, New York City, and may be obtained from them or from most druggists. L. EMMETT HOLT and L. E. LA FETRA.]

Literature of '96-'97-'98.

Decimal system devised, 10-per-cent. cream being used to introduce the fat, a saccharated skim-milk to introduce the proteids, and a standard sugar solution for adding the required amount of lactose. H. L. Coit (*Archives of Ped.*, May, '98).

HOME-MODIFICATION BY USING STAND-

ARD CREAM AND MILK MIXTURES.—This method is that which we have found the simplest, and, therefore, the most satisfactory.

In order to produce definite results by diluting milk, it is necessary to know, approximately at least, the average composition of the milk or the cream-milk mixture which is to be diluted. For practical purposes, mixed herd-milk may be considered as containing 4 per cent. of fat, 4.3 per cent. of sugar, and 4 per cent. of proteid. In Alderney and Jersey milk the fat is much higher. Cream—if obtained by the gravity method, the milk standing twelve hours—contains about 16 per cent. of fat. Light or thin centrifugal cream has about 20 per cent. of fat, while the heavy centrifugal cream contains from 30 to 40 per cent. of fat. Top-milk is the upper portion of the milk with the cream, taken after the milk has stood a definite number of hours. If, for example, one quart of milk stands on ice for twelve hours, the cream from it contains about 16 per cent. of fat; if it stands six hours, the upper 6 ounces contain about 12 per cent. of fat; if for three hours, the upper 10 ounces has about 8 per cent. of fat. In top-milk thus removed the sugar may be considered as 4 per cent. and the proteids as nearly 4 per cent. In this way one may obtain for dilution cream-milk mixtures containing any of the required percentages of fat.

MILK-SUGAR SOLUTIONS.—Since lactose must be added, it is convenient to add the sugar to the water, thus making a milk-sugar solution. Boiling water should be used, and if the solution is not clear it should be filtered through absorbent cotton. Moreover, the solution should be made fresh daily during warm weather; in cold weather it will keep for two days.

The table shows the amounts of milk-sugar and water required to make the standard solutions:—

STRENGTH OF SOLUTION.	AMOUNT OF MILK-SUGAR.	BOILING WATER.
4 per cent.	1 ounce	25 ounces
5 per cent.	1 ounce	20 ounces
6 per cent.	1 ounce	16 $\frac{3}{4}$ ounces
7 per cent.	1 ounce	14 ounces
8 per cent.	1 ounce	12 $\frac{1}{2}$ ounces
10 per cent.	1 ounce	10 ounces

[A small box holding exactly 1 ounce of milk-sugar may be gotten from any druggist. An even tablespoonful contains about 3 $\frac{1}{2}$ drachms of milk-sugar; so that, for an approximation, a tablespoonful of milk-sugar to each 8 ounces of the food adds 5 per cent. to the sugar ingredient. L. EMMETT HOLT and L. E. LA PETRA.]

Preparation of the Food for Healthy Infants.

Whereas it is impossible to give simple rules by which every infant can be successfully fed, still experience shows that average infants under one year old may be fed according to a schedule arranged for certain periods. The schedule applies to healthy infants of average weight, under average conditions, and is meant to serve as a general guide, not to be blindly followed, for varying circumstances will modify any plan of feeding.

FIRST PERIOD: FROM BIRTH TO THE END OF THE FOURTH MONTH.—In making up the food for this period experience shows that the best results for an average child are obtained when the *fat* in the formula is approximately *three times the amount of the proteid*: practically the ratio in breast-milk. Such a proportion may be obtained by using a cream-milk mixture in which the fat amounts to 12 per cent. This 12-per-cent. cream-milk mixture can be gotten by taking (a) equal parts of light centrifugal cream and dairy milk, or (b) 2

parts of gravity-cream and 1 part milk, or (c) the upper 6 ounces of a quart of milk after standing on ice for 6 hours.

1. For the *second, third, and fourth days* of life the formula should be: fat, 1.0 per cent.; sugar, 4.0 per cent.; proteids, 0.33 per cent. This may be made by taking 1 $\frac{1}{4}$ ounces of 12-per-cent.-cream-milk mixture, 13 $\frac{1}{4}$ ounces of 4-per-cent.-sugar solution, and $\frac{1}{2}$ ounce of lime-water.

The schedule for the number and intervals of feedings, with the amount at each feeding during twenty-four hours, is given on page 233.

2. For the *fifth, sixth, and seventh days* the formula should be: fat, 1.5; sugar, 5.0; proteids, 0.5 per cent. This may be made by taking 2 $\frac{1}{4}$ ounces of 12-per-cent. cream, 15 ounces of 5-per-cent.-sugar solution, and $\frac{3}{4}$ ounce of lime-water.

3. For the *second week* the formula should be: fat, 2.0; sugar, 6.0; proteid, 0.6 per cent. There are required, to make 18 ounces of this food: 3 ounces of 12-per-cent. cream, 14 $\frac{1}{4}$ ounces of 6-per-cent.-sugar solution, and $\frac{3}{4}$ ounce of lime-water. For 30 ounces, take 5 ounces of 12-per-cent. cream, 23 $\frac{3}{4}$ ounces of 6-per-cent.-sugar solution, and 1 $\frac{1}{4}$ ounces of lime-water.

4. For the *third and fourth weeks* the formula should be: fat, 2.5; sugar, 6.0; and proteids, 0.8 per cent. Twenty ounces of this formula may be made by taking 4 ounces of 12-per-cent. cream, 15 ounces of 6-per-cent.-sugar solution, and 1 ounce of lime-water. To make 32 ounces, take 6 $\frac{1}{2}$ ounces of 12-per-cent. cream, 24 ounces of 6-per-cent.-sugar solution, and 1 $\frac{1}{2}$ ounces of lime-water.

5. For the *second and third months* the formula should be: fat, 3.0; sugar, 6.0; and proteids, 1.0 per cent. To

make 24 ounces of this formula there are required 6 ounces of 12-per-cent. cream, $16\frac{3}{4}$ ounces of 5-per-cent.-sugar solution, and $1\frac{1}{4}$ ounces of lime-water. To make 36 ounces take 9 ounces of 12-per-cent. cream, $25\frac{1}{4}$ ounces of 5-per-cent.-sugar solution, and $1\frac{3}{4}$ ounces of lime-water.

6. For the *fourth month* the formula should be: fat, 3.6; sugar, 7.0; proteids, 1.2 per cent. To make 25 ounces of this formula take $7\frac{1}{2}$ ounces of 12-per-cent. cream, $16\frac{1}{4}$ ounces of 6-per-cent.-sugar solution, and $1\frac{1}{4}$ ounces of lime-water. To make 38 ounces, take $11\frac{1}{2}$ ounces of 12-per-cent. cream, $24\frac{1}{2}$ ounces of 6-per-cent.-sugar solution, and 2 ounces of lime-water.

SECOND PERIOD: FROM BEGINNING OF FIFTH TO END OF NINTH MONTH.—During this period the best results are obtained by using formulæ in which the *fat is about twice the proteid*. This proportion exists in the 8-per-cent.-cream-milk mixture which is used as the basis for modification during this period. The 8-per-cent. cream may be obtained by taking (a) 1 part of light centrifugal cream and 3 parts of milk, or (b) 1 part gravity cream and 2 parts of milk, or (c) the upper 10 ounces from a quart of milk which has stood on ice for 4 or 5 hours.

1. For the *fifth month* the formula should be: fat, 3.6; sugar, 7.0; and proteids, 1.8 per cent. Thirty ounces of this food may be made by taking $13\frac{1}{2}$ ounces of 8-per-cent. cream, 15 ounces of 6-per-cent.-sugar solution, and $1\frac{1}{2}$ ounces of lime-water. To make 40 ounces of this formula take 18 ounces of 8-per-cent. cream, 20 ounces of 6-per-cent.-sugar solution, and 2 ounces of lime-water.

2. For the *sixth, seventh, eighth, and ninth months* the formula should be:

fat, 4.0; sugar, 7.0; and proteids, 2.0 per cent. Thirty-six ounces of this formula may be made by taking 18 ounces of 8-per-cent. cream, $16\frac{1}{4}$ ounces of 5-per-cent.-sugar solution, and $1\frac{3}{4}$ ounces of lime-water. To make 42 ounces, take 21 ounces of 8-per-cent. cream, 19 ounces of 5-per-cent.-sugar solution, and 2 ounces of lime-water.

THIRD PERIOD: FROM THE TENTH TO THE FIFTEENTH MONTH.—During this period the best results are secured by having the *fat and the proteids approximately equal*, as they are in whole milk. With the whole milk during this period there should be combined some kind of farinaceous food. From the beginning of the tenth month to the end of the first year the proportions should be two-thirds dairy-milk and one-third of a moderately-thick gruel. After the infant is a year old the proportions may be changed to three-fourths milk and one-fourth of a thicker gruel.

PREPARATION OF THE DAILY SUPPLY.—The full quantity of food for twenty-four hours should be made at one time; then clean bottles for the required number of feedings are filled, stoppered with non-absorbent cotton, and sterilized, pasteurized, or, if the food is to be used raw, placed immediately on ice.

Literature of '96-'97-'98-'99.

Of the many hundred marasmic and rachitic infants observed, it is believed that fully 95 per cent. had been fed on the meal-foods or on condensed milk, chiefly the latter. In order to make up the deficiency of fats and proteids in condensed milk, cream may be added in proportion to make up the deficient fat. Among dispensary patients codliver-oil supplies the deficiency, the dose varying with the age of the baby, the ability to digest it, and the season of the year. Ten drops to a dessertspoonful, three or four times daily after feeding. During

very hot weather the dose must be reduced or suspended if there are evidences of gastro-intestinal disturbance.

The low proportion of proteids may be increased by adding a meat-broth. One pound of lean beef is boiled in one quart of water till the liquid is reduced to one pint. Such a broth contains 0.8 per cent. proteids; so that if 1 part of condensed milk is added to 12 of broth the mixture will contain 0.5 per cent. of fat, 1.4 per cent. of proteids, and 4 per cent. of sugar. This will answer for a child three months old, fat being supplied by codliver-oil. When the sixth month is reached 1 part of condensed milk may be added to 9 of broth. The percentages then will be, approximately, 0.75 per cent. of fat, 1.7 per cent. of proteids, and 5 per cent. of sugar. This, with codliver-oil, will answer until the eighth or ninth month, when barley- and oatmeal- gruel, with other meal mixtures, may be allowed. Kerley (*Med. News*, vol. lxx, No. 23, '97).

The number of children over four months of age who are fed exclusively on condensed milk are "an ill-conditioned class of children with their starved muscular and nervous systems and catarrhal tendencies, who fall an easy prey to broncho-pneumonia in the winter, to the gastro-intestinal diseases in the summer, and to the infectious diseases during the entire year." The chief objection to condensed milk as an infant-food is the fact that it contains a slight deficiency of proteids and an excessive and almost fatal deficiency of fat. Condensed milk cannot be changed or fortified so as to render it a desirable food; it may be made permissible; nevertheless, its use is not to be advised when a better food can be procured. Sometimes the practitioner is obliged to use it among the extreme poor.

One of the most frequent and serious errors in infant-feeding is overfeeding. Crandall (*Archives of Ped.*, Aug., '97).

Following requirements given for a perfect modified milk: (1) alkalinity and body-temperature, (2) sufficient quantity, (3) proper proportion of constituents, (4) digestibility, (5) freshness, sterility, and cleanliness, (6) absence of

adulteration. Edward Hamilton (*Amer. Jour. of Obst.*, etc., Aug., '98).

For home-modification of milk, Soxhlet, of Munich, has devised a formula which has proved of value in most cases. This can be made by diluting the milk coming from a very good dairy $\frac{1}{2}$ with water, for a child below nine months, and adding to each 8 ounces a teaspoonful of sugar of milk, dissolving the sugar of milk first in the 4 ounces of water, and then adding the 4 ounces of milk. Below three months the children should be given 3 ounces in each bottle, and 8 bottles in 24 hours. Henry Koplik (*N. Y. Med. Jour.*, Apr. 23, '98).

It is sometimes more difficult to digest laboratory-milk which has been centrifugated and then mixed than milk which has been modified at home. The laboratory-milk often shows large oil-globules floating on the top. If milk can be obtained pure it should be neither sterilized nor pasteurized. If one is not sure of his milk it should be pasteurized for 20 minutes at 156° F. Use of top-milk is recommended; this is obtained by letting the milk stand for 6 to 8 hours and taking the top quarter.

Each ounce of a 10-per-cent. cream in a 20-ounce mixture means that the resulting mixture will contain 0.5 per cent. of fat, 0.2 per cent. of proteids, and 0.2 per cent. of sugar, and each tablespoonful of sugar of milk added to this will raise the sugar 2 per cent. If it is desired to increase the proteids this is done by adding milk from which the cream has been removed, thus giving no more fats, but an added amount of proteids. By using the upper half of top-milk one obtains a mixture which contains but a little more than 7 per cent. of fat, and this can be used to make mixtures containing relatively high percentage of proteids. Townsend (*Boston Med. and Surg. Jour.*, Mar. 23, '99).

Bottles and Nipples.—Graduated cylindrical bottles, with wide mouths, are generally preferred, being easily cleansed. The best nipples are those of plain black rubber which slip over the neck of the bottle. On no account

should a nipple with a long rubber tube be used. The hole in the nipple should not be large enough to let the milk run in a stream when the bottle is inverted. Bottles should be boiled before the food is put into them; and both bottles and nipples thoroughly washed after use. Nipples should be kept in a borax or boric-acid solution.

Literature of '96-'97-'98.

The feeding question is at the root of the great mortality of infants; but of almost equal importance to the health of

should be allowed to sleep with the nipple in its mouth.

Literature of '96-'97-'98.

As the milk enters the child's mouth from the breast of the mother, its temperature is always below 98° F. It usually varies from 96.5° to 97° F. It is evident that milk given to children should not be heated above these temperatures. Smester (*Maladies de l'Enfance*, No. 15, '97).

Schedule for feeding healthy infants during the first year:—

AGE.	NO. OF FEEDINGS IN 24 HOURS.	INTERVAL BETWEEN MEALS BY DAY.	NIGHT-FEEDINGS (10 P.M. TO 7 A.M.).	QUANTITY FOR ONE FEEDING.	QUANTITY FOR 24 HOURS.
Third to seventh day	10	2	2	1 to 1½ ounces	10 to 15 ounces
Second and third weeks	10	2	2	1½ to 3 ounces	15 to 30 ounces
Fourth and fifth weeks	9	2	1	2½ to 3½ ounces	22 to 32 ounces
Sixth week to third month . . .	8	2½	1	3 to 4½ ounces	24 to 36 ounces
Third to fifth month	7	3	1	4 to 5½ ounces	28 to 38 ounces
Fifth to ninth month	6	3	0	5½ to 7 ounces	33 to 42 ounces
Ninth to twelfth month	5	3½	0	7½ to 9 ounces	37 to 45 ounces

the child is the receptacle from which it takes its nourishment, viz.: the nursing-bottle. A bottle furnished with a long rubber tube has been justly condemned, as it is an impossibility to keep the tube clean; and, therefore, the child draws impurities into the mouth, which, on account of its warmth and moisture, is one of the most prolific parts of the human anatomy for the propagation of every species of microbe. Henri de Rothschild (*Med. Times*, July, '98).

Rules for Artificial Feeding.

The rules as to frequency and regularity of feedings are more important with bottle-fed than with nursing babies. The table given below will serve as a guide. Just before feeding the food is heated to body-temperature by placing the bottle in a vessel of hot water; a bottle should not be warmed over for a second feeding. Twenty minutes is long enough for a feeding; no child

The Use of Other Substances than Milk during the First Year.

Besides the ingredients of modified milk, the only other foods to be given during the first year are beef-juice and the fruit-juices.

BEEF-JUICE may be added to the diet at about the tenth month. At first ½ ounce is given, either alone or with the milk; the amount may be increased up to 2 or 3 ounces daily, given at two or three feedings.

Attention called to milk-preparation which the writer's father used with great satisfaction for many years. The peculiarity of the mixture lies in the use of a weak veal-broth as a diluent, the salts of which he believed played an important rôle in its digestion. The recipe for this broth is as follows: ¼ pound of veal is boiled with ½ quart of water for from ½ to ¾ hour, and the loss is made up to the half-quart by the addition of

boiled water; this has been found to contain 0.2 to 0.3 per cent. of salts. Twelve and one-half fluidrachms of good whole milk are now diluted with an equal quantity of this broth, giving in the mixture a proportion of about 1.75 per cent. of fat. The deficiency in fat is made good by the addition of a teaspoonful of a 30-per-cent. cream, and the sugar is brought up to normal by the addition of 1 drachm of milk-sugar. The analysis of such a mixture gives: fat, 3.1 per cent.; casein, 1.8 per cent.; sugar, 6.2 per cent. Other dilutions may be made for the first weeks of life, or in later months, when nearly whole cows' milk can be digested. Wilhelm Steffen (Jahrb. f. Kinderh., B. 11, S. 421).

FRUIT-JUICES.—Strained orange-juice is the most useful of the fruit-juices, and may be added by the eleventh or twelfth month. It is best given about an hour before the feeding: $\frac{1}{2}$ to 1 or 2 ounces at a time. The fruit-juices are particularly useful in constipation.

Indications for Special Modifications.

I. FLATULENCE AND HABITUAL COLIC.

—These symptoms are almost invariably due to difficulty in the digestion of the proteids. The cause of this difficulty may be either that the proteids are too high or that the child has a feeble digestion as regards proteids. There are three methods of overcoming the difficulty: first, by reducing the proportion of proteids; second, by partly predigesting the proteids; and, third, by the addition to the milk of farinaceous substances which theoretically aid proteid digestion.

By Reducing the Proportion of Proteids.—Suppose, for example, a child of one month, taking the proper formula for that age, has colic. The proteids may be reduced without changing the percentage of sugar and fat by using a 16-per-cent. (gravity) cream instead of the 12-per-cent. cream, and making a

higher dilution with the sugar solution. Or, again, a child of six months may be taking 4-7-2, and suffer from flatulence and colic. The proper treatment is to return to one of the earlier formulæ,—as 3-6-1.

It must be kept in mind, however, that, after each change of formula to a higher proteid, there may be a slight amount of colic and flatulence for a day or so; one should not, therefore, be discouraged and go back to a lower percentage until a fair trial of the higher proportion has been made.

Literature of '96-'97-'98.

In cases of difficult proteid digestion best success obtained when proteids are reduced first to a minimum and then gradually; as the proteid digestion becomes stronger from not being overtaxed, their percentage is increased, until the amount necessary for nutrition is attained. Thus, beginning with a proteid percentage of 0.25, it is very gradually increased up to 1 and 1.5, and full percentage contained in cows' milk is only allowed after the infant has passed its twelfth month. In summer-diarrhœal cases low percentages of all the elements of the milk afford the best results, personal average percentages being: fat, 1.5 to 2.5; sugar, 4.5 to 5.5; proteids, 0.25 to 0.67. Rotch (Med. News, Apr. 3, '97).

By Partly Peptonizing the Food.—At first the food may be peptonized for an hour, preferably just before the feeding-time; later the process may be shortened to fifteen or even ten minutes. The use of the peptonizing tubes is most satisfactory; but a somewhat similar result is produced by using the peptogenic milk-powder. Peptonized milk should not be given for a longer period than absolutely necessary,—never, if possible, longer than three months,—lest the child gradually lose its ability to digest proteids. It must be remembered that,

even with peptonizing as an adjunct, a proper formula is essential.

Literature of '96-'97-'98.

Use of pancreatized foods deprecated as general foods for infants. The only conditions in which pancreatized foods are useful are in cases of gastric disorder or severe exhaustion accompanying or following acute disease. The preparation most suitable as an addition to cows' milk is wheat- or oat- flour mixed with ground malt. Aitchison Robertson (Brit. Med. Jour., June 13, '96).

By Adding Farinaceous Substances to the Food.—Experience indicates very clearly that many children can manage the proteids of cows' milk more easily when some farinaceous substance in the form of gruel is added to the food; and that many of the signs of proteid indigestion—flatulence, colic, etc.—are relieved by this addition.

[The best explanation of this fact appears to be that the presence of these carbohydrates in the stomach and intestines prevents decomposition of the proteids and favors their utilization in larger proportion. L. EMMETT HOLT and L. E. LA FETRA.]

Literature of '96-'97-'98-'99.

Personal experiments showing that it is possible to cause a marked decrease in nitrogen elimination, or an increase in nitrogen retention, by adding carbohydrates to the food. Arthur Keller (Centralb. f. Inn. Med., Jan. 14, '99).

In practice the simplest way to add carbohydrates to the nourishment is to use a gruel made of barley, oatmeal, or wheat to replace part or all of the water of the formula. Barley-gruel is the one most employed, and is easily made by boiling one tablespoonful of barley-flour in a pint of water for twenty minutes. This may be used to replace half the water in any of the foregoing formulæ, and it usually influences not only the in-

testinal colic, but also has a marked effect on flatulence in the stomach. The gruel made from oatmeal is preferable if there is constipation; that made from barley- or wheat- flour if there is diarrhœa.

Literature of '96-'97-'98.

In the case of infants whose nutrition is at fault, particularly when this is indicated by a persistent eczema, very best results obtained from adding a certain wheat-produce to the food. The wheat-produce is prepared according to the following directions, which must be rigorously adhered to:—

A teaspoonful of wheaten grits or crushed wheat is put in a pint of cold water in a china receptacle, in a double boiler, at the time of preparing the evening meal, and is allowed to cook slowly for two hours. It is then covered and set aside until morning, when it will be found more or less jellified. Some water should now be added so as to make it quite thin, and it is then cooked for two hours more. After this second cooking it is rubbed through a fine sieve with the bowl of a spoon, more water being added if necessary. The hard and indigestible portions of the wheat are left on the sieve, and the gelatinous mass which passes through contains all the nutritive portion of the wheat. This portion will readily pass through the feeding-bottle. It must be prepared fresh every day. For very young infants it is sufficient to add 1 or 2 teaspoonfuls to each feeding, while older children may take as much as a tablespoonful of it. A weak solution of this wheat-jelly is an admirable substitute for barley-water in infant-feeding. L. Duncan Bulkley (Pediatrics; Canada Lancet, Sept., '98).

The milk is manipulated too much in the laboratories. One obtains by this method 3 or 4 per cent. of fat, but the fat is not in a fine emulsion, and clinically the fat, in order to be thoroughly assimilated, must be in a fine emulsion. Many babies, not assimilating the casein, will improve by using a thin barley-water that has been malted. Henry

Dwight Chapin (N. Y. Med. Jour., Apr. 23, '98).

Sometimes children do, for various reasons, require starch earlier than at first supposed, although this is the exception, and not the rule. If that is true of younger children it must be still more true of those past the first year of life. Potato-starch is not a very digestible article for children in the second year of life. Animal fibre should not be given before eighteen months, but beef-juice should be used instead. J. P. Crozer Griffith (Annals of Gyn. and Ped., Apr., '98).

II. CURDS IN THE STOOLS. — This symptom has the same causes as flatulence and colic, and the dietetic treatment is the same.

Literature of '96-'97-'98.

Good rules to follow are to watch the stools, and if, by their color, consistency, or the presence of undigested matter, the food is found not to be the proper one, alteration is in order. Edwin Rosenthal (Med. Fortnightly, June 15, '98).

It is of paramount importance to know:—

1. The chemical reaction of the alvine discharges: *i.e.*, whether acid or alkaline. If the reaction is excessively acid, this is due to the carbohydrates; if very alkaline we may infer that this is due to the ingestion of the albuminous foods.

2. The color. If this be green, we may infer that the infant has eaten too much of the albuminous foods or has taken its milk too fast.

3. Odor. If this is scarcely perceptible, or slightly sour, the cause is certainly the starchy foods, while if very offensive it must be due to the proteid foods.

4. Consistence. If the discharge is very thin, with little mucus and no blood and not very frequent action, this would indicate that the seat of the trouble is in the small gut; while if the consistence is somewhat heavier and the discharge contains mucus with perhaps some blood, accompanied by tormina and tenesmus, the lesion is in the colon.

5. Digestion. If solid particles are

seen we may at once determine what food to withhold.

6. Constitutional symptoms. If there is a high temperature, it is certainly due to the albuminous foods. J. F. Kahler (Med. Rec.; Med. World, Aug., '98).

III. VOMITING.—If shortly after feeding, the regurgitation is generally to be remedied by diminishing the quantity or the frequency of the feedings, or both. If the vomiting occurs an hour or so after a feeding it is often due to too much fat, and the fat should be reduced. For example, if an infant taking 3-6-1 vomits between feedings it would be well to change the formula to 2-6-1. This formula can be made by taking 8-per-cent. cream and diluting with 3 parts of 5-per-cent.-sugar solution; moreover, any formula in which the fat percentage is twice the proteids may be obtained by diluting the 8-per-cent. cream.

In some conditions of slow stomach-digestion it is better to feed every three or four hours, instead of every two or two and a half hours.

IV. LOSS OF APPETITE.—The indication is to make the intervals of feeding longer, the quantity smaller, and the food more dilute; this applies particularly to the fat. The symptom indicates feeble digestion, for the time being, and can best be treated by greatly reducing the amount of work required.

V. CONSTIPATION.—This is a frequent symptom, and is always hard to control. The difficulty often is that there is insufficient residue, and this is to be overcome by increasing the proportions of all the ingredients. A second cause is too small a percentage of fat; but it is seldom advisable to increase the fat above 4 per cent., because of constipation.

Too often the constipation depends on bad habits rather than on anything

wrong with the food; so that early training is of prime importance.

VI. DIARRHŒA.—A diarrhœa which has as a cause simply a wrong proportion in the food is very rare. Frequent almost normal movements, however, may be due to too high fat. Generally the diarrhœa is due to acute or subacute indigestion in the intestines.

VII. FAILURE TO GAIN IN WEIGHT.—This symptom, in a child with a good appetite and good digestion, means insufficient nourishment. The quantity of the food should first be increased, and then the proportions of fat and proteids gradually raised, so as not to disturb the digestion.

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NUX VOMICA.—Nux vomica (poison-nut, Quaker button, semen strychni) is the seed of *Strychnos nux-vomica*, a tree (nat. ord., *Loganiaceæ*) growing in the East Indies, Cochin China, and neighboring countries. All parts of the tree are bitter and poisonous. The seeds are disk-shaped, about an inch in diameter, covered with silky hairs, of a greenish-gray color, and grayish white internally. They are very tough and are reduced to powder with difficulty. They are without odor, but are very bitter to the taste. The seeds contain the alkaloids strychnine ($\frac{1}{4}$ to $\frac{3}{5}$ per cent.), and brucine ($\frac{1}{8}$ to 1 per cent.) in combination with igasuric (strychnine) acid, and also the glucoside loganin, a yellow coloring matter, a concrete oil, gum, starch, wax, and earthy phosphates. The powdered drug varies in alkaloidal strength, and in using the preparations it is necessary to have them standardized to insure uniformity of physiological and therapeutic effect.

Brucine, one of the alkaloids found in *Strychnos nux-vomica*, and also in *Strychnos Ignatii*, occurs as a light, white, crystalline powder, soluble in 850 parts of water, and more soluble in alcohol ($1\frac{1}{2}$ parts) and in chloroform. It is with difficulty separated from strychnine, in many samples of which it is present as an impurity. In effect it is one-twelfth as powerful as strychnine, and one-third as quick. The dose is $\frac{1}{10}$ to $\frac{1}{2}$ grain; maximum daily dose is 3 grains.

Strychnine will be considered alone, in its proper place; although it is the representative alkaloid of nux vomica, it has, however, its own peculiar field of usefulness.

Ignatia may claim our attention here on account of its close resemblance to nux vomica, not only as to its alkaloidal constituents, but also on account of the similarity of its physiological action and therapeutic uses. Ignatia (bean of St. Ignatius) is the seed of the *Strychnos Ignatii*, a tree indigenous to the Philippine Islands, where the seeds were used as a medicine by the natives. The Jesuit missionaries named it in honor of the founder of their order. The seeds of ignatia yield a larger proportion of strychnine, brucine, and igasuric acid than can be obtained from nux vomica. Tincture of ignatia may be given in doses of 1 to 15 minims in all diseases in which nux vomica is indicated.

Preparations and Doses.—Nux vomica (powdered nut), 1 to 4 grains.

Extractum nucis vomicæ, $\frac{1}{4}$ to 1 grain.

Extractum nucis vomicæ fluidum, 1 to 4 minims.

Tinctura nucis vomicæ, 5 to 15 grains.

Physiological Action.—The physiological action of nux vomica is that of its principal alkaloid, strychnine, and will be reviewed at length when the lat-

ter is considered (see STRYCHNINE, volume vi).

Poisoning by Nux Vomica.—In 10 to 20 minutes after the poison is ingested the first symptoms usually appear. General uneasiness and restlessness are followed by a feeling of suffocation. The muscles twitch and the head and limbs begin to jerk. Later, violent tetanic convulsions come on, which soon involve the whole body. The face is drawn into a grin (*risus sardonicus*), the lower jaw becomes fixed, the neck rigid, the pupils dilated, the reflexes heightened, then paroxysmal attacks of tonic contraction occur, at intervals varying from five minutes to half an hour, especially of the extensor muscles of the body, producing opisthotonos. The eyeballs become prominent; the respiration is impeded, from tetanic spasm of the respiratory muscles; and the face becomes livid. The paroxysm may last from a half-minute to several minutes, when it subsides and is followed by a period of relaxation during which the patient is bathed in perspiration and is utterly prostrated. The paroxysm returns in a few minutes, being precipitated by the slightest cause—a breath of wind, a slight noise, an effort to move, or an attempt at being fed. The paroxysm increases in frequency and violence, the pulse becomes feeble and rapid, and death results usually after four or five hours from asphyxia or collapse, the mind remaining clear to the last. The fatal dose is generally stated to be 30 grains of the powdered nut, the weight of one seed, 3 grains of the solid extract, or 3 grains of strychnine; but $\frac{1}{16}$ grain of strychnine has proved fatal in a child and $\frac{1}{4}$ grain in an adult.

Treatment of Poisoning by Nux Vomica.—The immediate use of emetics and of the stomach-pump, if the lock-jaw

permit it, is indicated. The use of chloroform may overcome the lock-jaw and benefit the patient in other respects. Animal charcoal and tannic acid may be given *ad libitum*, followed by an emetic. Thirst may be relieved by strong tea. The catheter should be used when required. Absolute quiet, so far as possible, should be maintained. Bromides in large doses, chloral, amyl-nitrite, curare, morphine, and atropine may prove efficient antidotes. The antidotes may be given by the rectum; artificial respiration is sometimes indicated.

Therapeutics.—Nux vomica may be employed as a simple, bitter tonic; as a special tonic in diseases of the nervous system; or as a respiratory, cardiac, or ocular stimulant. Care should be exercised when giving nux vomica or its preparations to children, as a small dose influences them profoundly.

Literature of '96-'97-'98.

The only contra-indications to nux vomica in children are those in which there is marked reflex excitability of the nervous system. Comby (*La Méd. Mod.*, Mar. 28, '96).

GASTRO-INTESTINAL DISORDERS.—The preparations of nux vomica, like other bitters, produce a sensation of hunger, and, on account of an inherent slight irritant action upon the gastric mucous membrane, increase the digestive secretions and thereby promote digestion. They are found useful in cases of debility, and in convalescence, where the tongue is more or less coated and the digestion weak. One or two drops of the tincture in a teaspoonful of water every two hours or oftener, for twenty-four to forty-eight hours, will clear the tongue, improve the digestion, and prepare the way for stronger tonics and more liberal diet (Ringer).

Flatulence and heart-burn generally yield to small doses of the tincture given three or four times daily. In acute gastric catarrh accompanied by sick headache, but without much nausea, due generally to some error in diet or to constipation, prompt relief is obtained from nux vomica. One drop of the tincture in a teaspoonful of water every five or ten minutes, for eight to ten doses, and then continued at longer intervals, will often mitigate this kind of headache, and in a few hours remove it, when otherwise it would have continued severe all day (Ringer). In chronic gastric catarrh and the morning sickness of drunkards, nux vomica is next in value to arsenic; it is best given with the mineral acids (Bartholow). The poor appetite, feeble digestion, and the nervousness and trembling which follow the sudden withdrawal of alcoholic stimulants are relieved by frequent, small doses of the tincture. To diminish the craving for stimulants and sustain the nervous system, Bartholow advises 5 drops of the tincture combined with 15 drops of the tincture of capsicum, given every four hours. Intestinal indigestion and flatulence may be removed by the tincture of nux vomica. Atonic dyspepsia, due to a paretic condition of the muscular coat of the bowel, is relieved by this drug in combination with other appropriate remedies.

In constipation nux vomica is a useful addition to purgatives, for its stimulating and tonic effect upon the muscular coat of the bowel. In some forms of epidemic dysentery this drug is indicated where there is a depressed condition of the vital forces associated with tympany and prune-juice stools.

In the threatening collapse of cholera, nux vomica combined with opium and the mineral acids is indicated; it is also

useful as a prophylactic during the preliminary diarrhœa.

In summer diarrhœa where the stools are watery and in colliquative diarrhœa the same combination is efficient; if much pain be present, the quantity of opium may be increased or a double dose given at first. Bartholow suggests the following:—

R Strychninæ sulph., $\frac{1}{4}$ grain.
Acidi sulphurici dil., \mathfrak{z} ss.
Morphinæ sulph., gr. ij.
Aq. camph., \mathfrak{z} iiiss.

M. Sig.: A teaspoonful every hour or two, well diluted.

UTERINE DISORDERS.—The neuralgic form of dysmenorrhœa is permanently removed by the administration of nux vomica during the intervals. Nux vomica is given in many cases of amenorrhœa for its tonic action on the pelvic viscera. In post-mortem hæmorrhage Fordyce Barker's well-known formula is: Tincture of nux vomica, 20 drops; fluid extract of ergot, 30 drops; to be given every half-hour until the uterus is well contracted. Not more than two or three doses of this would be necessary or safe.

BLOOD DISORDERS.—Nux vomica is useful to improve the quantity of impoverished blood, as it stimulates the blood-making organs. Combined with iron and quinine, it is of great value in anæmia, chlorosis, purpura, and in the hæmorrhagic diathesis. In intermittent fever it is employed as an adjuvant to quinine.

NERVOUS DISORDERS.—In impotence due to mere relaxation and atony of the erectile tissue, and not to organic effects, nux vomica is indicated. Incontinence of urine, when due to a paretic state of the sphincters, may sometimes be cured by nux vomica. Nocturnal incontinence—when not relieved by belladonna, ergot,

and iron—may be benefited by *nux vomica*. Amaurosis either from lead poisoning or from the abuse of alcohol or tobacco may be cured by this drug. Eye-strain from insufficiency of the ocular muscles yields readily to the influence of *nux vomica*. De Schweinitz advises the use of ascending doses of the tincture, beginning with 3 drops, three times daily until distinct physiological effects are produced. Sometimes 60 drops may be taken in twenty-four hours after tolerance is reached.

After the occurrence of brain lesions

this drug is useful to maintain the nutrition of the paralyzed member. It is not safe, however, until after repair of the lesion, nor useful if electrical reaction is absent.

PULMONARY DISORDERS.—*Nux vomica* is useful in dyspnoea dependent upon winter cough, bronchorrhoea, emphysema, and phthisis. It is a valuable stimulant in pneumonia, when collapse threatens.

C. SUMNER WITHERSTINE,

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O

OBSTRUCTION, INTESTINAL (ILEUS).

Definition.—A complete or partial occlusion of any portion of the intestinal canal, caused by strangulation, intussusception (invagination), twisting or knotting (volvulus), strictures, tumors, faecal impactions, concretions, or foreign bodies. The occlusion may occur suddenly, causing *acute obstruction*, or be of gradual development and but reduce the diameter of the intestinal canal: *chronic obstruction*. An acute obstruction may become chronic and a chronic case may become acute; it is, therefore, sometimes difficult to determine accurately the condition which we have to deal with, for one form may take on a few or many of the symptoms of the other (Keen).

General Symptomatology. — **ACUTE OBSTRUCTION.**—Colicky pains coming on suddenly after a more or less prolonged period of constipation and nausea are the earliest symptoms witnessed in the majority of cases. At first paroxysmal, the pain soon becomes continuous, the suffering increasing steadily in severity. Nausea is soon followed by vomiting,

which also increases in severity until it constitutes a most distressing symptom. The contents of the stomach are first voided; this is followed by a greenish fluid stained with bile, which becomes brown, and finally stercoraceous, emitting the characteristic faecal odor. Constipation is persistent, though bloody mucus and a small quantity of faecal matter (that below the obstruction) may be discharged *per anum*. There is distension of the abdomen with tympanitic resonance; this constitutes the most constant of the local signs. This abdomen is very sensitive to the touch when the case has progressed some time. Borborygmus and gurgling may be detected on auscultation.

The general symptoms indicate the grave character of the disease present. The features are pinched and the entire surface cold and clammy, the temperature being subnormal. The eyes are sunken; a bluish-black tinge around them and beneath the nostrils gives the face a cadaverous expression. Thirst is usually marked, and the mouth and tongue are dry. The pulse is rapid and

feeble and sometimes irregular, the breathing being correspondingly more frequent. The urine is scanty and high colored; in some cases there is anuria. Finally all the evidences of imminent collapse appear, and the patient, if unrelieved, passes into coma. Death may occur in from two to six days after the first manifestations.

Literature of '96-'97-'98-'99.

Two cases of asphyxia from vomiting in intestinal obstruction, in both of which the patients, suffering from acute symptoms of obstruction, vomited in the early stages of the anæsthesia such enormous quantities of fluid as to interrupt respiration. J. Ernest Stokes (*Annals of Surg.*, Sept., '97).

-Obstruction of the small intestine is more likely to cause severe shock than that of the colon.

In case obstruction is complete, pain will be constant, yet periods of intensified suffering will repeatedly come on. If the obstruction is only partial, the liquid contents and gases will be forced past the constriction, and for a time the peristaltic pains will subside and the patient will be free from suffering until more gas is generated or another reflex wave is excited. In intussusception the constriction, early in the case, is usually incomplete, hence the pain is not so severe; there is no tenderness on pressure, and sometimes firm pressure relieves the pain. Many cases of obstruction develop septic peritonitis. A. H. Cordier (*Jour. Amer. Med. Assoc.*, Feb. 4, '99).

CHRONIC OBSTRUCTION.—In chronic obstruction, the most frequent cause of which is fecal impaction, obstinate constipation usually follows a prolonged period during which the intestinal functions were characterized by great irregularity—several days' constipation perhaps followed by the elimination of hardened masses, presenting various shapes, round balls resembling the fæces of small herbivorous animals, sheep, rabbits, etc.,

or softer matter, ribbon or pencil shaped, the mass remaining within the intestine and obstructing it presenting a channel through which the fæces passed are molded. Mucus is also voided, sometimes in large quantities.

These symptoms may be accompanied by other insignificant general ones—perhaps a slight headache and a feeling of distension; but, when the obstruction becomes marked, then those recalling acute obstruction appear: abdominal pain, vomiting, abdominal distension, borborygmus, etc. The peristaltic action of the intestine may be easily discerned, not only by the hand, but visually. Palpation sometimes makes it possible to distinctly locate the impacted mass through the abdominal walls.

These attacks may recede—generally through successful efforts to move the intestines by injections, salines, etc., to which the patient has become habituated, but they finally become frequent, the patient gradually becoming emaciated and anæmic until unconquerable occlusion occurs, when the case becomes, in point of severity, one of acute obstruction, with all its attending dangers—increased to a marked degree by the gradual decline of the vital resistance of the organ involved.

In chronic obstruction due to other causes—cancer, cicatricial contraction—the symptoms do not vary much from those just enumerated, but in cases of cancerous stricture the facies may afford an early clue to the nature of the causative disease present.

Diagnosis.—The *seat* of the impaction must first be detected—a feature presenting no little difficulty, unless, as is sometimes the case in chronic obstruction, the mass be distinctly felt through the abdominal walls. Even when this valuable sign cannot be obtained, however, inspection of the abdomen affords much

information. By carefully palpating its entire surface areas of comparative resistance may be detected, or the outline of a section of intestine, the curve of the colon, for instance, can be clearly made out, sometimes as a rigid tube of large size. This may be due to spasm or to the accumulation of gases, the latter tending to indicate, when the gut is tense, that the obstruction is low down. If the obstruction is in the ascending colon or the first half of its transverse portion, it may often be made out by following the course of the gut from the cæcum. Pain is usually sharpest at the seat of occlusion.

When the occlusion appears to be situated (judging from the inflated colon) in the posterior part of the transverse portion or lower, a systematic examination should be resorted to, beginning at the anus. The anus itself may prove to be the source of trouble, or scybalous masses may be found immediately above it. Rectal examination with the finger and speculum may reveal organic obstructions located immediately above the sphincter. In intussusception the invaginated bowel sometimes reaches the anus. Enemas may be of assistance to show the extent to which the lower bowel is free, but a powerful stream may prove dangerous if cancer be present; hence a douche-bag elevated but a few feet above the patient's buttocks had better be used, the patient lying either on the back with hips raised or on the right side, or in the genu-pectoral position. The entire colon should contain $1\frac{1}{2}$ gallons, but 1 gallon is about all that can usually be introduced in the adult without force and if but a smaller quantity—sometimes but a few ounces—can be introduced, the evidence may serve to strengthen the other signs. Examination by the introduction of the entire hand or by the rectal sound

is not a safe procedure. Forced inflation by means of bellows or bicarbonate of soda and tartaric acid may also be tried, but not when cancer is thought to be present.

In obstruction of the colon tenesmus is frequently present, while mucus and blood are commonly passed; emaciation and general collapse do not occur as early as in occlusion of the small intestine, while the flow of urine is not greatly reduced. A digital vaginal examination sometimes affords further information.

In obstruction of the duodenum or jejunum the abdomen is not, as a rule, distended; vomiting occurs early; collapse is rapid; and the flow of urine usually ceases early. Palpation may be deceptive in this location, the portion of intestine below the seat of the obstruction often sinking into the pelvis and dragging the stenosed intestine some distance below its normal situation and beyond reach.

History of several cases of stenosis of the duodenum below the ductus choledochus. Symptoms of stenosis above the duct resemble in every particular pyloric stenosis, while those below are manifested by a continual vomiting of bile or the permanent presence of bile in the chyme of the stomach. Boas (*Deut. med. Woch.*, July 9, '91).

When the cæcum or the ileum is the seat of obstruction, the distension appears to involve the centre of the abdomen rather than the sides. The outline of the anterior portion of the small intestines may appear through the abdominal walls and present the "ladder pattern." The case progresses much more rapidly, faecal vomiting occurring early.

All cases, without exception, should be examined for hernia, since fatal impaction may follow the intrusion into the external ring or the obturator foramen of a comparatively small loop of intestine.

The *nature* of the obstruction must next be ascertained.

STRANGULATION.—A history of peritonitis or abdominal injury during which adhesions were established, followed by periodical attacks of abdominal pain, suggests the presence of strangulation, especially when occurring in an adult. The active symptoms of an acute attack usually appear suddenly and may be very severe, but occasionally vomiting and even nausea do not occur; when vomiting attends the case it is apt to become stercoraceous after the third day. The prostration is usually very marked. No tumor can be felt in the majority of cases; neither is blood or mucus passed, the constipation being absolute. There is usually but slight abdominal tympany or tenderness at first, these symptoms becoming manifest late in the history of the case.

INTUSSUSCEPTION.—Invagination of one portion of the intestine into an adjoining portion is, as a rule, easily recognized. Palpation of the abdominal walls discloses, in most cases, a transverse elongated tumor on the right side of the middle line: a region corresponding with the portion of the transverse colon nearest the surface. The presence of this tumor, the passage of blood-stained mucus, and tenesmus are the distinctive features of this form of stenosis. Stercoraceous vomiting is frequently absent, tympany and distension likewise. Vomiting occurs early, and the prostration is generally marked. As already stated, the invaginated bowel may sometimes be detected in the rectum by digital examination. Intussusception is almost invariably met with in children.

TWISTING OR KNOTTING (VOLVULUS).—This form of obstruction is far more difficult to recognize. It presents the main symptoms of intestinal obstruction,

including preliminary constipation; but there is, as a rule, no history of tenesmus or of muco-sanguineous stools. The acute symptoms appear suddenly and are severe from the start, abdominal distension and tenderness being especially marked. Vomiting is apt to come on late, however; it is rarely stercoraceous, the lesion, in the majority of cases, being situated at the sigmoid flexure. Constipation is absolute and intestinal gases are retained. The usual position of the volvulus causes it to lie deep in the pelvic cavity, and it cannot, therefore, be felt through the abdominal walls. Occasionally the intestine is sufficiently weighted by accumulated feces to bring it within reach of the finger in the rectum or through the vaginal wall. The passage of a flexible bougie or of fluids by injection is sometimes advised. Exploratory laparotomy is often necessary.

FÆCAL OBSTRUCTION.—Fæcal obstruction is situated, in the great majority of cases, in the rectum or the sigmoid flexure: parts habituated to the pressure of more or less large masses of fæcal matter. It is, therefore, slow of development: a chronic form. After a prolonged period of constipation—following, perhaps, a period during which small, hard, rounded masses were voided (as described under chronic obstruction)—acute symptoms supervene, which may be suddenly relieved by a copious passage. When this does not occur, however, abdominal pain, nausea and vomiting, and gradually increasing distension follow in more or less rapid succession; and, when the vomiting becomes fæcal, collapse is imminent. Examination of the rectum by the finger or speculum quickly clears the diagnosis in most cases. Vaginal examination also assists when the impaction is somewhat high. Abdominal palpation is only of use when the accu-

mulation is very large. This form is often met with in the insane, especially in females.

OBSTRUCTION BY STRICTURE OR COMPRESSION.—The manifestations of this form resemble those of faecal obstruction, but there is often a history of several slight acute attacks accompanied by the passage of ribboned faecal matter. Mucosanguineous stools are seldom witnessed.

OBSTRUCTION DUE TO INTESTINAL PARESIS.—Functional obstruction usually results from previous inflammatory disorders or may be due to paresis after rough handling of the intestines during an intra-abdominal operation. Peristalsis is often absent; there is but little or no pain. The course of the case is that of a case of faecal impaction, though the acute symptoms may develop much more slowly and be less severe.

OBSTRUCTION BY FOREIGN BODIES AND CONCRETIONS.—The history of the case alone affords valuable information, the symptoms varying greatly. It is only when a sufficiently large foreign body becomes firmly impacted to excite tumefaction in the intestinal tissues that it gives rise to symptoms of acute obstruction similar to those defined. In obstruction due to gall-stones there is a history of hepatic colic and jaundice in a small proportion of cases. The pain and vomiting occur early, the latter being severe from the start, and becoming stercoraceous in the majority of cases. A tumor being rarely detected, the differential diagnosis is difficult.

Literature of '96-'97-'98.

Case of a man, aged 70 years, who was suffering from vague gastro-intestinal symptoms for about one year, when suddenly he was attacked, while at breakfast, with acute pain in the left side, midway between the umbilicus and the spine of the ilium. This was soon followed by evacuation of the bowels and

vomiting, which became stercoraceous on the following day. Tympanites was moderate. Little pain on palpation. A tumor-like mass could be recognized below and internal to the sigmoid. A probable diagnosis of volvulus having been made, an operation was performed, which revealed an impacted gall-stone $4\frac{1}{2}$ by 6 inches in circumference and $2\frac{1}{16}$ inches in length.

Possibilities of spontaneous evacuation of the stone is possible in from 30 to 50 per cent. of the cases. The remaining 50 to 70 per cent. will die if not relieved by operation. The mortality from the operation is also very high. Faecal vomiting should be the signal for operative interference in any form of obstruction when other means fail. Lavage is of very great value even in cases surgically treated. When employed before the operation it prevents vomiting. Lord (Jour. Amer. Med. Assoc., Oct., '98).

The diagnosis *from other disorders* must be established. Most prominent among these are colic, acute enteritis, acute generalized peritonitis, and acute hæmorrhagic pancreatitis.

COLIC.—The abdominal pain usually termed "colic" is often associated with the temporary retention of faecal matter in any part of the intestine or any local irritation, but the spasmodic character of the pain, its broad distribution from side to side, and the absence of any localized spot of sensitiveness usually facilitate recognition of the condition present. The prompt relief obtained from remedial measures, the response to purgatives, and the general history of the case usually place the diagnosis on a solid footing. Vomiting and collapse may also attend cases of cholera morbus, but faecal vomiting only occurs in obstruction.

Literature of '96-'97-'98-'99.

The location of pain does not imply that the obstruction is there. In obstruction of the small intestine pain is apt to be located about 2 inches above

the umbilicus at the site of the solar plexus; and if not adherent the small intestines constantly change position. If the obstruction be in the colon, the location of the pain might be of some service in making a diagnosis of the bowel involved, as the colon does not have much latitude of motion; and pain having its origin in the colon is not apt to be referred to the solar plexus. Contents of the intestines do not become feculent until near the ileo-cæcal valve; hence the vomiting of fecal matter would imply obstruction in the colon or the lower portion of the ileum. An obstruction in the upper jejunum is usually attended with profuse vomiting of thin, bile-stained fluid, non-feculent in character, yet by rapid decomposition or long distension the odor of the contents of this portion of the bowel may become very offensive. A. H. Cordier (*Jour. Amer. Med. Assoc.*, Feb. 4, '99).

ACUTE ENTERITIS.—Irritant poisons also give rise to symptoms simulating intestinal obstruction, but we have the history, the probable presence in the vomitus of the toxic agent ingested, or of food liable to assume poisonous properties. As a rule, there is also violent diarrhœa, possibly tinged with blood; raised temperature; intense pain, located, not only in the abdomen, but also in the stomach, and generally referred to the "pit" over this organ—all characteristic signs. Though the later stages of a case of acute enteritis may be attended by collapse and other symptoms of obstruction, fecal vomiting is always absent.

ACUTE HÆMORRHAGIC PANCREATITIS.—This condition is attended by symptoms closely simulating those of acute intestinal obstruction. In the early stages the true nature of the trouble present can scarcely be established without an exploratory laparotomy. Fæcal vomiting has not been observed in any case of acute hæmorrhagic pancreatitis so far observed.

ACUTE GENERALIZED PERITONITIS.—

In this condition the chief distinctive features are an early rise of temperature, the history, and the general tympany and abdominal tenderness. There is a history of appendicitis, ulcer, traumatism, or some condition capable of leading to peritonitis, attended by an early and marked rise of temperature. The pain is not localized and the abdominal wall is so tender that the weight of the sheets even causes severe suffering. The abdomen is greatly and generally distended, and peristaltic action cannot therefore be discerned. The later stages of the cases also differ: collapse comes on later, while fecal vomiting is never observed.

Importance of a very careful diagnosis emphasized, as intestinal obstruction has been frequently confounded with hysteria, hepatic colic, crises in locomotor ataxia, and certain forms of poisoning. L. Revilliod (*Revue Méd. de la Suisse Rom.*, Sept. 20, '92).

Etiology and Pathology.—Though the term "obstruction" is usually included in the list of diseases, it is obviously not an affection, but a mere general appellation indicating the general etiological factor. The causes, nature, and the lesions attending the various forms of obstruction are, therefore, to be reviewed under this head.

STRANGULATION.—Of all the varieties of obstruction, this is the most frequent, representing, as it does, fully one-third of the cases classified. Strangulation occurs as the result of adhesions in over 60 per cent. of cases, the bands being due, in the majority, to previous attacks of peritonitis, to various causes, or to any other local inflammatory process entangling, compressing, or surrounding the loop of intestine involved.

Strangulation may also be the result of an anomalous union between the end

of Meckel's diverticulum and the abdominal wall or the mesentery, a loop being thus formed into which a portion of intestine may become engaged and strangulated. The tip of the vermiform appendix may also, in the same manner, become the source of strangulation. Slits in the omentum or mesentery, or peritoneal openings or diverticula, adventitious or normal, the foramen of Winslow, the duodeno-jejunal fossa, openings in the diaphragm, etc., represent as many traps into which a loop of intestine may become caught and strangulated.

The small intestine is involved in 90 per cent. of the cases; and the obstruction occurs, according to Osler, in the right iliac fossa in 67 per cent. of the cases and in the lower abdomen in 83 per cent. Seventy per cent. of the cases occur in males, and 40 per cent. of all cases occur between the ages of 15 and 30 years.

INTUSSUSCEPTION. — Intussusception, or invagination of one portion of intestine into another portion of the same, is mainly due to irregular peristalsis, resulting, in turn, either from constipation, diarrhoea, colic, or paralysis. Nearly 40 per cent. of the cases occur in children. In a series of 500 fatal cases from some form of intestinal obstruction, Brinton found that 215 were due to invagination. In 103 cases collected from literature Wiggin noted that 50 per cent. occurred during the fourth, fifth, and sixth months in equal proportions, 75 per cent. of the patients being males. All but 12 cases were of the ileo-cæcal variety. In this variety the ileo-cæcal valve becomes invaginated into the colon, its much larger continuation, and may thus reach down to the anus, as witnessed in a case reported by Lange. The other varieties, met with in about

10 per cent. of all cases, are the ileo-colic, in which the lower portion of the ileum passes through the ileo-cæcal valve; the ileal, in which the ileum is alone the seat of invagination; the colic, in which the colon is alone involved; and the colico-rectal, in which the colon is invaginated into the rectum.

Intussusception with the passage of a portion of the intestines twenty-nine inches long on the fifteenth day, witnessed in a woman aged 56 years. Editorial (*Edinburgh Med. Jour.*, Apr., '88).

Sixty-four cases of intussusception observed in children within a period of twenty-one years; the majority—46 cases—were boys. The age at which the trouble occurred most frequently was from the third to the ninth month, more than one-half the cases occurring at this period. Among the 46 infants under 1 year, 39 were exclusively breast-fed. Only 2 were bottle-fed from birth. Hirschsprung (*Jahrbuch f. Kinderh. u. phys. Erzie.*, B. 39, H. 4, '95).

Literature of '96-'97-'98-'99.

Intussusception is the cause of fully 30 per cent. of all cases of acute obstruction. The greatest proportion of cases of intussusception, fully 50 per cent., occur in children under ten years of age, and of these more than 50 per cent. occur in infants under twelve months. Between the ages of five and forty to fifty the number of cases diminish, and after forty or fifty the frequency of occurrence is again noted. This condition may be explained upon the grounds of periods of debility, occurring in infancy and extreme adult age. J. F. Erdmann (*Med. News*, Dec. 24, '98).

Careful search made through the records of the Children's Infirmary of Liverpool, and it was found that out of 130,000 new patients there were only 16 cases of intussusception. Of these 16 cases only 7 recovered. The age at which intussusception usually occurs is somewhere between the fourth and sixth months of life. Murray (*Liverpool Medico-Chir. Jour.*, Jan., '99).

According to Nothnagel, invagination,

or intussusception, is brought about by contraction of the longitudinal muscular fibres of the portion of intestine that overrides or receives the upper portion within itself, the irregular peristalsis of the invaginated portion assisting. Thus telescoped, the two lengths of intestine form a cylindrical mass varying in length up to two feet or even more. Three layers of intestine are thus superposed: the external (intussusciptions), or receiving layer, acting as sheath for the invaginated portion; the middle layer, and the internal (intussusceptum) layer.

By application of a ligature to the intestines of an animal it was found that if it be applied sufficiently tight to cause complete obstruction, violent peristalsis is caused above the seat of ligation, but that no antiperistalsis is produced. Fæcal vomiting is accounted for by the fact that in the direction of the stomach least resistance is encountered. Nothnagel (N. Y. Med. Jour., Apr. 13, '89).

Literature of '96-'97-'98.

The evidence derived from anatomical, physiological, pathological, and clinical *data* renders it legitimate to assert that spontaneous ileo-cæcal intussusception occurs when the colon is considerably larger than the ileum, and is so unduly movable that it readily allows itself to become invaginated when once the process has begun. This variety of intussusception is essentially an affection of childhood, and such an undue increase in the width of the colon implies either a congenital abnormality or an unduly rapid growth, for at birth the diameter of the large intestine is practically the same as that of the ileum.

The physiological factor is much less easy to specify than the anatomical, for it is almost certainly an individual peculiarity. It may be stated broadly, however, that, as regards the ileo-cæcal portion of the intestine, the increased mobility, coupled with the unduly rapid growth in the width of the large intestine, is probably associated with in-

creased and irregular peristaltic movements of the large intestine. D'Arcy Power (Brit. Med. Jour., Feb. 13, '97).

The main etiological factors of external origin are blows upon the abdomen, violent muscular movements, sudden or repeated jars of the body as in jumping, and particularly the violent jolting which infants sometimes receive when too violently handled.

Literature of '96-'97-'98.

In 103 cases of infantile intussusception nearly 50 per cent. occurred during the fourth, fifth, and sixth months, in nearly equal proportions; 75.4 per cent. of the cases occurred in males, and 89 per cent. were of the ileo-cæcal variety. Pritchard called attention to the probable part played by external violence in the causation of this disorder during early life, particularly the careless manner in which infants are picked up and doubled over the arm of those caring for them, thereby injuring and causing a temporary paralysis of some portion of the intestinal canal. Jacobi has also called attention to this matter, particularly to the way in which infants are violently jumped up and down to quiet their cry. Frederick Holme Wiggin (Med. Record, Jan. 18, '96).

Intestinal tumors may act as causative agents by dragging the portion of intestine to which they are attached into the adjoining portion.

Example of the causation of intussusception by polypus within the intestines. Van Bibber (Maryland Med. Jour., Dec. 31, '87).

In one case the principal cause of obstruction was found, after death, to have been due to a polypoid growth of the small intestine. C. McBurney (N. Y. Med. Jour., Mar. 28, '91).

Sodium bicarbonate causes contraction of the circular fibres of the intestine. Peristalsis continuing, invagination produced, thus showing one class of intussusceptions. R. T. Morris (N. Y. Med. Jour., Feb. 23, '95).

The post-mortem findings depend upon the duration of the intussusception. When death occurs early in the course of the attack but little change is observed. When the case has progressed some time, besides the invaginated portion of gut there may be localized peritonitis and, as a result of the circulation of blood by the tension and compression of the mesentery, more or less marked inflammation, extending to necrosis and sloughing of the tissues involved in the invagination. At first but little lymph is thrown out between the layers of gut in contact, and they may be easily disengaged; but, when the inflammatory process progresses some time, the surfaces adhere and cannot be separated. The only chance for the patient then is that the invaginated portion slough off, union occurring between the upper edge of the external layer and the free end of the intestine immediately above the invagination. This not infrequently occurs, the detached portion of gut being voided *per anum*.

VOLVULUS.—Twists and knots (volvulus) are more rarely met with than the forms just described: in about 12 per cent. of all cases of intestinal obstruction, according to Fitz's statistics. Volvulus generally occurs in adults between the ages of 30 and 50 years, and more frequently in males than females. It is usually associated with abnormal length of the intestine involved and a lax mesentery. In children this elongation of the mesentery is always congenital (Keen). In adults, on the contrary, it is usually acquired, and arises in chronic constipation, from the weight of large masses of feces, which pull down and drag upon the mesentery, thus causing its relaxation and elongation. In a case reported by Pillard, for instance, the sigmoid flexure was as large as the entire

colon: a phenomenon frequently present, doubtless, since one-half the cases of volvulus reported suffered from lesions in this location. Next in frequency is the cæcum. A twist in the long axis of the gut is usually observed, but the intestine may be sharply bent upon itself, a loop may become twisted around another portion, or a knot be formed. Several causes of obstruction may be simultaneously present, as in a case witnessed by Bérard, in which a twist, a knot, and a constricting band were revealed by laparotomy.

Interesting case of a woman, 59 years old, in whom the use of the corset had brought about complete division of the right lobe of the liver, the inferior portion, nearly six centimetres in length, being united to that organ merely by a band of fibrous tissue, and pushed upward. The gall-bladder was united to the moving fragment, and fixed to the colon by adhesions of peritoneum. In consequence of these lesions the transverse colon was drawn up, and the traction thus exerted had induced a twisting of the intestines and an obstruction of the intra-intestinal circulation; the accumulation of feces and gas beyond that fold had completed the occlusion. Bonuzzi (*Revista Ven. di Sci. Med.*, Jan., '92).

Purely mechanical twist may give rise to symptoms without paralysis of twisted portions. Pseudostrangulation may supervene after reposition of gangrenous loop and peritoneal infection follow. Great prostration and high pulse are indications of the latter. Nicolaysen (*Norsk Mag. f. Laeg.*, June, '95).

FOREIGN BODIES.—Intestinal obstruction seldom occurs as a result of impacted bodies, though many of these are accidentally swallowed. Many cases have been reported in which pointed metallic bodies even (Tily, Reverdin, Fourneaux, and others) were ingested and voided without accident. Occasionally, however,

an object becomes impacted in the intestinal tract and may give rise to symptoms of intestinal obstruction in any region, even when near the anal orifice.

Case observed in which all the symptoms of acute intestinal obstruction disappeared upon the removal of a fish-bone from the anus, eight centimetres above the external orifice. The bone had been swallowed some twenty-four hours previously. J. Grundzach (Wiener med. Presse, No. 10, '95).

Lunatics are especially prone to ingest articles of various kinds,—nails, pins, needles, hair, etc.,—and obstruction from this cause is therefore comparatively frequent in these subjects. In ordinary life, however, obstruction is more frequently due to the ingestion of large objects, artificial teeth, buckles, opened safety-pins, etc. Intestinal obstruction is occasionally caused by large quantities of seeds, "blackberry-time" thus being the source of an occasional case. Lumbricoid worms may also form a tangled mass and obstruct the intestinal lumen. (See also ESOPHAGUS, FOREIGN BODIES IN.)

GALL-STONES AND ENTEROLITHS.—Cases of intestinal gall-stone occlusion are comparatively rare considering the frequency of cholelithiasis. They are also infrequent as compared to other forms of obstruction, Leichtenstein having found but 41 cases among 1541 cases of intestinal obstruction from various causes. It is usually observed after the fiftieth year. Eighty per cent. of the cases reported occurred in women after the fiftieth year. The impaction always occurs in the small intestine, in the neighborhood of the ileo-cæcal valve, and occasionally in the duodenum. The impacted mass may consist of but one calculus or of a large number. They penetrate the intestinal wall through an opening created by pressure-ulcera-

tion, involving the gall-bladder and the intestine affected.

Enteroliths are rarely observed in the human species. They are mainly composed of phosphate of lime and magnesia, and develop around a nucleus of hardened fæces, a gall-stone, or a small foreign body. Magnesia and bismuth taken as remedies in large quantities occasionally form enteroliths; these are usually light and porous. Masses of hair, or quantities of oatmeal (avenoliths), starch, and other *Graminaceæ* may thus become foci for enteroliths.

Intestinal concretion discovered post-mortem in the cæcum of a woman who had been suffering from chronic intestinal catarrh, for which she had been treated by the internal administration (among other things) of subnitrate of bismuth. The concretion was bean-shaped, one centimetre long, of a dirty, brownish-yellow color, odorless and tasteless (*sic!*), light, porous, friable, and easily reducible to powder. It weighed 14 grains.

Under the microscope the enterolith was found to consist of very minute amorphous granules. Chemical analysis showed that the concretion was composed of 85 per cent. of subnitrate of bismuth with 15 per cent. of some organic substance. W. F. Mentin (Wratsch, Mar. 28, '91).

Literature of '96-'97-'98.

Interesting case in which intestinal obstruction was caused by an enterolith. The stone weighed about $1\frac{1}{2}$ ounce; its long diameter was $1\frac{1}{2}$ inches, its short diameter 1 inch. Archibald Cuff (Quart. Med. Jour., Apr., '97).

FÆCAL OBSTRUCTION.—This form of obstruction occurs at any age, but particularly in the aged and in children, as a result, doubtless, of impaired tonicity of the muscular coat of the intestine affected: usually the colon or rectum. The colon may become, as a result of the accumulation of fæcal matter and gas,

enormously enlarged. This is commonly channeled, small amounts of fæces passing until the complete occlusion occurs. In acute cases the wall of the distended gut is extremely thin, but in chronic cases, those in which the lumen has become very gradually narrowed or characterized by prolonged periods of constipation, compensatory hypertrophy occurs in its muscular layer. Rupture occasionally occurs, especially when ulceration of the mucous membrane is caused by the pressure of the contents.

POST-OPERATIVE OBSTRUCTION.—Intestinal obstruction following operation is caused, according to Deaver, either by paresis, the result of traumatism or sepsis, or a combination of these, or to mechanical causes. About 2 per cent. of deaths following abdominal section are due to mechanical or true intestinal obstruction. The most important form occurs when the intestine becomes adherent to a fixed surface which has been denuded of peritoneum. As a result of the adhesion the bowel becomes kinked and immobile. Obstruction may also occur as a result of adhesion of the bowel to neighboring coils of intestine; here another factor usually comes into play: bending of the bowel over the brim of the pelvis or over the omentum whose free edge has become attached. Still another variety occurs from bands of adhesions running from one place to another, under which a knuckle of gut slips and becomes fixed. A variety of purely mechanical obstruction and one that should never occur arises from including a portion of the bowel in a ligature. A knuckle of gut slipping through a hole in the omentum may also give rise to obstruction of the bowel as a result of abdominal operation.

The statistics of Spencer Wells and Fritsch both give about 1 per cent. of

intestinal obstruction as the proportion after ovariectomy. The writer comments on fifty-seven cases which he has been able to collect, and finds that twenty-seven of them followed ovariectomy, and apparently as often after simple cases as after the more complicated ones. The symptoms of obstruction supervened either early in the case—*i.e.*, within ten or fifteen days, and most frequently from the third to the fifth—or they were postponed to a much later date, such as months or years subsequently. F. Legueu (*Gaz. des Hôp.*, Nov. 23, '95).

Certain number of post-operative occlusions of the intestines are due to the physiological impermeability of the left subcostal angle of the colon. When the small intestine is placed in a plane posterior to the angle of the colon, this angle is not compressed and its permeability is less liable to be interfered with. Adenot (*Gaz. Hebdom. de Méd. et de Chir.*, Mar. 18, '95).

Literature of '96-'97-'98.

It is estimated that from 1 to 2 per cent. of deaths after laparotomy occur from intestinal obstruction.

Many cases diagnosed as sepsis are primarily obstruction.

The symptoms of post-operative obstruction are vomiting first of undigested food and fluids, later of a bilious character, and finally stercoraceous; shock and inability to pass fæces, or flatus; but, if the obstruction be high up, passages from below the obstructed point may be discharged. Hugh M. Taylor (*Va. Med. Monthly*, Jan., '96).

Seven cases of intestinal obstruction following laparotomy seen, five of which were fatal. The obstruction always occurs in the small intestine near the seat of the operation, and most frequently quite near the junction of the small and large intestines.

There are no clear-cut, positive symptoms. There is a wide difference in the symptoms from those which indicate the usual acute intestinal obstruction. In none of the cases was the integrity of the intestine involved; probably the operation had so lowered the vital forces that paralysis of the bowel took place, peri-

stalsis ceased, and septic poisoning occurred through accumulation of the secretions of the bowel. The main symptoms in these cases are persistent vomiting, which is of much more significance when it comes on several hours after the operation and is not due to the anæsthetic; pain, which might be local or general, and frequently is not severe. The temperature is not usually marked, but the pulse is rapid and there is a peculiar, anxious expression of countenance which is quite characteristic. H. O. Marey (*Med. Rec.*, May 23, '96).

Post-operative intestinal obstruction is due to tonic muscular spasm, to true intestinal paralysis, to the formation of new adhesions, or to pre-existing constriction not discovered or relieved at the time of operation. Boise (*Med. News*, July 18, '96).

Treatment.—Whatever measure is resorted to for the relief of acute intestinal obstruction must be used promptly, but of equal importance is the avoidance of remedies which, though seemingly indicated, are hurtful. Among these may be classed purgatives. The most active factor in the production of suffering is exaggerated peristalsis; to administer drastic purgatives, etc., but accentuates the torture of the patient, exposes him to early collapse, and increases the chances of rupture. Especially is this a fact when some foreign substance—such as a pin, needle, etc.—has been swallowed. Under such circumstances, the patient must be given food which will have much solid residuum, such as oatmeal, cornmeal, or large quantities of bananas or mashed potatoes. The latter is especially useful when sharp bodies have been swallowed. The prolonged constipation preceding the acute attack has usually caused the patient to resort to various measures, which, though ineffectual as purgatives, have already induced partial exhaustion of the intestinal muscular fibres.

Literature of '96-'97-'98.

Purgatives are absolutely contra-indicated in all cases of acute obstruction, and are of very limited, exceptional, and temporary advantage in chronic cases. T. F. Prewitt (*Jour. Amer. Med. Assoc.*, Apr. 23, '98).

Extreme caution is necessary in the administration of laxatives when an obstruction of the intestine may be the cause of the symptoms. If the bowels are not moved, an attempt at purgation makes the patient much worse, and too often induces a state of collapse, which renders an operation hopeless; or, if an operation be performed, the bowel is found so distended and paralyzed that it cannot recover its tone. C. P. Gildersleeve (*Med. News*, Mar. 26, '98).

The use of opiates tends, likewise, to reduce the vital activity of the intestinal tissues; morphine should only be used, therefore, when there is severe pain, and just enough should be administered hypodermically to assuage the suffering.

Attention called to harmful effect of opium in intestinal obstruction. In case of acute intestinal obstruction, in a vigorous boy of 19 years, due to a fibrous band, the abdomen was opened, the band divided, and the patient did well until the fourth day, when, suddenly, vomiting and symptoms of obstruction reappeared. Wound was perfectly healthy. In searching for cause of symptoms it was found that patient had received about 5 grains of opium during the four days after operation, contrary to instructions. Castor-oil was administered, in drachm doses every half-hour, until bowels were moved, when symptoms disappeared and the patient again entered on convalescence. Thierry (*Bull. de la Soc. Anat.*, Oct., '92).

The distressing vomiting first claims attention. The most satisfactory measure is lavage of the stomach. Not only is the vomiting relieved, but all other symptoms, including undue peristalsis, seem to be reduced in intensity, and the patient is advantageously prepared for

operative procedures should such become necessary. Practiced repeatedly,—*i.e.*, every three or four hours,—this measure has alone proved curative in some cases.

Washing out of the stomach in intestinal obstruction regarded as useful. Difficulty is to determine in which cases and under what circumstances it should be carried out, as it is not equally applicable in all cases. On ground of experience, two special indications recommended: First and most important of these is distension of stomach, where vomiting is not present or has ceased suddenly. It is estimated that this condition is seen in about one-fifth of all cases of ileus. Absence or cessation of vomiting is often looked upon as being due to the œsophagus's being folded over the opening in the diaphragm and its lumen blocked. However, introduction of a tube takes place without difficulty, and evacuation of a large amount of fluid gives great relief, often without any washing out. A further indication is the occurrence of feculent vomiting. Repeated cleansing of the stomach removes the abnormal contents and prevents the absorption of injurious material. Aufricht (*Ther. Monats.*, Aug., '91).

The most effective methods for the reduction of the obstruction are the use of large water enemata and the insufflation of air. The former is to be preferred; the quantity of liquid used can easily be gauged, while the pressure can conveniently be regulated by raising or lowering the vessel from which the fluid is obtained. As noted by Jeffreys Wood, before attempting to reduce an intussusception with water sufficient assistance must be secured. The child is, of necessity, exposed a great deal during the treatment; so that a hot-water bag to lie on, with cotton-wadding coverings over the legs, are necessary to prevent too much shock. The height at which the funnel or irrigator is held is about four feet. An ordinary red-rubber tube one-

half to five-eighths inch in diameter, as used for washing out the stomach, may be used.

Literature of '96-'97-'98.

Injection is preferable to inflation in acute intussusception, because the force can be graduated with much greater accuracy, while the apparatus is always at hand. D'Arcy Power (*Brit. Med. Jour.*, vol. i, p. 453, '97).

Experienced clinicians usually recommend preliminary anæsthesia, but in many cases the state of the patient does not warrant this proceeding: an advantageous one in every way when it can be adopted. D'Arcy Power places the patient under chloroform and steadily fills his intestine with hot salt solution under an hydrostatic pressure of not more than 3 feet in a child, the fluid being allowed to remain in the intestine at least 10 minutes. The inclined posture or the genu-pectoral position may be used, but complete inversion is better. By inverting the patient, the fluid not only reaches farther, but the traction induced by the weight of the invaginated portion of the intestine tends to disengage it. Jonathan Hutchinson further assists the above measure by thoroughly kneading the abdomen and violent shaking of the patient, the latter being held in the inverted position by several persons. Plain warm water is used by some, warm olive-oil by others.

Literature of '96-'97-'98.

The injections, if they are to be of any use, must be given intelligently. An anæsthetic must be given, the buttocks must be raised, and warm olive-oil injected by means of an ordinary enema-syringe. If the anus is held around the nozzle of the syringe, very considerable pressure can be exercised on the column of oil. Injections of warm oil should be given in all cases after the child is under the anæsthetic, even in cases of

long standing when we know that it is possible to complete the reduction by this means, because it always reduces the intussusception to a certain extent, and in the best and gentlest possible way. Clubbe (*Brit. Med. Jour.*, Nov. 6, '97).

While the liquid is being introduced, the physician's hand should assist by gentle taxis the liberation of the invaginated or obstructed gut. Manning states that in reducing an intussusception traction from above the mass should never be employed; for, should the parts be gangrenous, slight traction may suffice to rend them and allow the intestinal contents to pass into the peritoneal cavity. Pressure on the apex of the mass in the direction opposite to that which it formed will reduce it with the least danger.

Case in which enemata led to rupture of ulcer of transverse colon. Barnard (*Brit. Med. Jour.*, May 11, '95).

Literature of '96-'97-'98-'99.

Injections should not be used after the third day in intussusception except as the preliminary step of a possible immediate laparotomy. F. A. Packard (*Med. and Surg. Reporter*, Dec. 11, '97).

There is apt to be cracking of the serous coat of the large intestine when the resultant pressure of the fluid distending the colon is about two and a half pounds—that is to say, when the irrigator is raised five feet above the body of the patient; and this accident usually happens when the irrigator is raised to eight feet, though the bowel may be completely ruptured when the reservoir is only raised to the height of six feet. D'Arcy Power (*Brit. Med. Jour.*, p. 453, vol. i, '97).

In employing mechanical means of reduction of intussusception, the pressure of the injected fluid should on no account exceed that equal to a column of water three feet high, since otherwise there is a very real danger of rupturing the inflamed gut. Chances of effecting reduction by injection are three to one

against it. Therefore in all cases primary laparotomy is advised. Murray (*Liverpool Medico-Chir. Jour.*, Jan., '99).

The patient does not lie quietly in bed during the early hours of the disease, but is constantly tossing and moaning and continues doing so until the gut is reduced or until gangrene and sepsis are established. If after an injection the restlessness and moaning cease,—*i.e.*, during the first twenty-four to forty-eight hours,—it can be safely stated that reduction has taken place. J. T. Erdmann (*Med. News*, Dec. 24, '98).

Enemata are seldom successful after the first forty-eight hours, every hour saved up to the end of that period increasing the chances of complete reduction of the obstruction. Again, the likelihood of success is far greater when the obstruction is located in the colon.

When enemata prove unsuccessful, insufflation of air should be tried. This, however, offers greater danger of rupture owing to the fact that the quantity of air used cannot be carefully gauged. On the other hand, air penetrates more readily the ileo-cæcal valve and may thus be more effective than water when the obstruction is situated in the small intestine. Carbonic dioxide has also been used for the purpose, but is inferior to air.

Literature of '96-'97-'98.

In acute intussusception inflation preferred on the ground that it is easier to determine whether reduction has taken place, both during and after its use, than when injections of fluids are given. Emmett Holt (*"Diseases of Children,"* p. 387, '97).

In intussusception in children distending the bowel by inflation of air is a better and safer method of reducing the invagination by mechanical means than the distension of the bowel by water. The child should be clothed in a jacket of wool, and the legs and arms covered with wool and bandaged. It is then anæsthetized, and an ordinary enema-

pipe introduced into the rectum. This pipe is connected by means of a piece of India-rubber tubing to a pair of common bellows, or, if it is at hand, a Lund inflator. The outside of the tube around the anus is carefully packed with wool, which is held in position by an assistant, so as to prevent the escape of air by the side of the tube. The child is now inverted and held by a nurse, while the bellows are slowly and steadily worked by an assistant. The surgeon should have his hand placed on the abdomen of the child so that he can feel the tumor. As the intestine is inflated he will gradually feel the colon becoming distended, and he can regulate the amount of air introduced and stop it as soon as he feels the colon is distended as far as is safe. If the plan succeeds and the invagination is reduced he will suddenly feel the tumor disappear from under his hand, and the air will become diffused over the whole abdomen, so that what was at first distension of the colon is now a uniform distension of the abdomen. More importance attached to this sign than to the sudden disappearance of the tumor as an indication that the intussusception has been reduced.

Treatment by operation is a very severe proceeding in infants and quite young children, and is often followed by death.

In 64 cases of laparotomy undertaken for the relief of intussusception in infants under one year of age, 21 recovered and 43 died. Pickering Pick (Quarterly Med. Jour., Jan., '97).

In intussusception, distension of the bowel with gentle external manipulation should be tried in recent acute cases, the surgeon being present and prepared to operate at once if these means fail. Inflation may be contra-indicated by the severity of the symptoms or their chronicity. Great care should be taken that the reduction of the intussusception is complete; thickening about the ileo-cæcal valve may simulate incomplete reduction, so that when in doubt the part should be examined through an incision in the bowel. Any attempt to fix the bowel after reduction by sutures seems to be contra-indicated. Small doses of

opium should be given after operation. When reduction is impossible, resection through an incision in the colon seems to give the best chance, the junction between the large and small bowel being made secure before any part is cut away. D'Arcy Power (Jour. Path. and Bact., June, '97).

Out of 33 cases of intussusception treated by enemata or inflation, recorded by Fitz, 22 were saved. Wiggin collected 39 cases of the same kind in 23 of which these measures proved successful. Recurrence is apt to occur in intussusception, however. This is ascribed by Frederic Eve in the large class of ileo-cæcal intussusceptions to the ileo-cæcal orifice's still remaining slightly invaginated into the cæcum.

In intestinal obstruction *following laparotomy* H. O. Marcy states that injections are of no use. A careful examination of the intestine should be made at the site of the operation, then in the region of the appendix, and then of the omentum, and the obstruction will usually be found. If this is done early the difficulty can be corrected. In desperate cases an incision may be made in the abdomen; the first inflated coil of intestine seized, attached to the wound, and opened, establishing an artificial anus; and thus the patient is carried along until a thorough and radical operation can be performed. As a prevention of this complication he believes that careful suturing of every abrasion of the peritoneum is of great value.

The tympanites, besides adding to the suffering, sometimes prevents the expulsive effort of the intestine, by totally arresting peristaltic action. The chances of reduction are greatly increased in some cases by elimination of the intestinal gases. Sweetnam reduces tympanites by posture. In very extreme distension he recommends the knee-chest

position, but in cases of moderate distension he places the patient upon the side and elevates the foot of the bed. It may be necessary to keep the hips in the elevated position for ten or fifteen minutes before the contents of the abdominal cavity gravitate sufficiently from the pelvis to enable the upper portion of the rectum to pass out of the pelvis toward the abdominal cavity.

Relief will not be secured until this occurs. In marked tympanites the distension is practically confined to the large intestine, and obstruction to the escape of flatus is due to the downward pressure of the descending colon and sigmoid flexure upon the upper portion of the rectum, forcing the folds of Houston one upon the other and bringing about, for the time being, an impermeable stricture. An attempt to pass this by the soft-rubber tube will fail, because the tube will coil upon itself. Turpentine stupes and hot applications are excellent adjuvants.

When tympanites is extreme and cannot be relieved by the means indicated, puncture of the gut through the abdominal wall is recommended by some authorities. A small aspirator-needle thoroughly *asepticized* should be used and left *in situ* until collapse of the gut is manifest.

Puncture of abdomen justifiable at such time when death seems imminent. When there is great distension of the bowel after the abdomen has been opened, the aspirator-needle, or, better still, the scalpel, should be resorted to at once, to allow the escape of such gas and intestinal contents, before an effort is made to search for the obstruction. H. T. Hanks (Amer. Jour. of Obstet., vol. xxiv, No. 4, '91).

The use of electricity in addition to the mechanical action of water is advocated by Mingour and Bergonié. A 2-

per-cent. salt solution may be used, the positive pole of a galvanic battery being placed on the abdomen and the negative in the rectum.

Literature of '96-'97-'98.

Case of a child, aged 5½ years, who developed signs and symptoms of intestinal obstruction with faecal intoxication. For seven days purges and enemata were administered without result, and the patient became wasted and collapsed, with a weak pulse and a tympanitic abdomen.

Recourse was finally had to electricity. A large indifferent electrode was placed on the abdomen and used as the positive pole. Into the rectum about a pint of salt solution was injected, and a rectal sound 4½ inches long, introduced as the negative pole. The current was gradually raised to 20 milliampères and after three minutes to 23; one or two interruptions having been made, a rush of faecal matter, amounting to about 3 pints, followed, and was succeeded by the immediate recovery of the patient. Mingour and Bergonié (Arch. d'Elect. Méd., No. 52, '97).

If, after a short, but faithful, trial of the methods indicated, no satisfactory result is reached, the abdomen should be opened. Wiggin states that, as a preparatory treatment in operations for intestinal obstruction, the stomach should be washed out, if there has been much vomiting or abdominal distension, while an intravenous saline injection of three pints will be useful if the patient is suffering from shock. If the site of the obstruction is not located, he recommends that the incision be made through the right rectus, between the umbilicus and pubis. If the intestinal coils be greatly distended, the distension should be relieved by aspiration or, if need be, incision. He states that in the after-treatment excessive thirst may be allayed by two or three large doses of bismuth

subnitrate, and after the first day the patient may be made more comfortable if allowed to lie on his side. The general tendency is to give too small quantities of nourishment at too frequent intervals: a system which fatigues the stomach and is likely to cause irritability of the organ.

In chronic cases—*i.e.*, when the symptoms are not strongly marked and the obstruction is shown to be incomplete by the occasional passage of small quantities of fecal matter, perhaps mucoid and tinged with blood—the possibility that intussusception is present and that the invaginated portion will slough off and bring about recovery should be borne in mind. Still, as correctly emphasized by Erdmann, these cases can never be claimed as true cures, owing to the likelihood of stricture-formation's following the sloughing process, and the fact that they are very prone to be followed by obstruction, demanding at a later day an emergency operation, which is likely to have a more serious aspect than would the question of primary operation for intussusception.

Literature of '96-'97-'98-'99.

Of the 52 cases of intussusception collected from private sources, the average age was thirty months. Vomiting was present in 89 per cent.; bloody, mucous evacuations in 87 per cent.; severe pain in 85 per cent.; tumor in 79 per cent.; and tenesmus in 77 per cent. Two cases were subject to medical treatment alone, both resulting fatally, 2 cases had no treatment and both died; 43 were subject to injections; of these, 15 were subsequently operated on. Of the 28 cases not operated on, but treated only by injection, 16 recovered; of the 15 cases operated on, 3 recovered. Edward Martin (*Med. and Surg. Reporter*, Dec. 11, '97).

Following points emphasized: (1) that a patient may suffer from fatal obstruc-

tion and not present the classical symptoms, (2) that the symptoms of obstruction vary with the site of the obstruction, (3) that early and definite diagnosis is essential, (4) that the use of aperients is likely to do harm, (5) that the exhibition of opium is likely to mask the symptoms and to produce signs of improvement which are entirely delusive, (6) that the time during which operative treatment is likely to be successful is very short, (7) that the bowel must be evacuated at the time of the operation, otherwise the patient may be poisoned by his own excrement, and (8) that it is probably safer to be content with colotomy or enterotomy where the bowel is seriously damaged. R. C. Ellsworth (*Lancet*, May 27, '99).

Many cases are brought to the surgeon so late that the patient is exhausted. An extensive laparotomy is out of the question under these circumstances. Wharton advises a colostomy. The opening should be made in the sigmoid flexure, if it be certain that the obstruction be below that point, otherwise the abdomen should be incised in the right iliac region and the cæcum opened, if it be found distended.

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ÆSOPHAGUS, DISEASES OF.

Malformations.—*Congenital occlusion*, due to the fact that during embryological development the invagination forming the mouth fails to open into the posterior end of the primitive intestine; *diverticula*, of similar origin, and *fistulae* due to incomplete closure of the branchial clefts represent the main malformations met with in this region. *Congenital narrowing* due to abnormal thickness of the wall or to the presence of membrane and *congenital dilatation* are also, though very rarely, witnessed.

Acquired Diverticula (Pharyngo-celes).

SYMPTOMS.—A diverticulum may occur as the result of inflammation or injury; the œsophageal wall is weakened, a portion of it bulges out, forming a circumscribed sac, or hernia, through the muscular coat. While small, a pouch thus formed is hardly noticed, but, as small particles of food find their way into it, it is gradually enlarged, projecting downward. It may become several inches deep, is usually elongated, and appears externally as a pear-shaped growth between the larynx and the sterno-mastoid muscle. It may, by its pressure, displace the œsophagus and the larynx, causing violent coughing through pressure upon the superior laryngeal and dyspnœa. Dysphagia, fœtor of the breath, regurgitation of ill-smelling masses of sodden food, and local pain are experienced in severe cases. Death from inanition has resulted.

DIAGNOSIS.—A diverticulum may easily be recognized by palpation, especially when the patient is lying on his side, the tremor being upward. When it contains air, pressure upon it causes this to pass out and its size is reduced; when it contains food, pressure either causes marked lateral displacement of the œsophagus or the food is forced up into the œsophagus and mouth. It is often enlarged after meals. The sound may be used; it should be bent so as to enable it to enter the cavity, and be handled with great gentleness.

ETIOLOGY.—Inflammation and injury to the muscular coat are the predominating factors. It is usually observed in men, and at the spot where the pharynx ends to become the œsophagus. The congenital forms are usually situated near the inferior constrictor.

TREATMENT. — Operative procedures

are alone of value. The tumor should be reached and excised and the margins secured with catgut sutures. This measure, introduced by Wheeler, is usually successful.

Traction Diverticula.

This is a form of diverticulum which presents itself near the bifurcation of the trachea, in the anterior wall of the œsophageal canal. It is generally associated with inflammation of the lymph-glands in this locality. Local inflammation followed by ulceration gives rise to cicatrices which by their contraction draw on the œsophagus: *i.e.*, exercise traction upon it, forming a cavity opening into the œsophageal canal by a funnel-shaped orifice.

SYMPTOMS.—Mechanical irritation is occasionally produced by the retention of food, and ulceration may follow, attended by its usual complication—perforation. A fistula between the œsophagus and the bronchial tract may be followed sooner or later by pneumonia.

The pleura and pericardium may also be reached. In the majority of cases the symptoms are slight; it is only on account of the possible mortal complications that traction diverticula demand attention.

TREATMENT.—Surgical removal alone affords protection against possible complications.

Foreign Bodies in the Œsophagus.

Foreign bodies frequently become impacted in the œsophagus, fish-bones, pieces of meat, pins, tacks, artificial teeth, coins, and buttons representing the class of articles found in the majority of cases.

Symptoms.—These vary according to the shape, size, and location of the impacted agent. A large mass, such as a piece of meat, may become engaged behind the larynx and hold the tip of the

epiglottis down, completely closing the laryngeal cavity. Here, intense dyspnœa soon comes on and death from asphyxia may promptly follow. Or a part of a bolus may invade the larynx and cause violent spasm; asphyxia again becomes possible from two causes: spasm and reduction or total closure of the respiratory area. Small bodies may produce the same symptoms, but, as is the case with large masses,—meat, bread, etc.,—they seldom give rise to dangerous symptoms, unless the larynx is involved by pressure, puncture, or the epiglottis is held down in some way.

Sharp or irregular bodies,—such as chicken-bones, tacks, etc.,—when impacted only in the œsophagus,—usually at its upper portion and immediately behind the cricoid cartilage,—only cause marked discomfort and severe pain, especially marked during deglutition; but they are attended with little or no immediate danger. The pain may radiate in various directions. Hæmorrhage or rather slight bleeding is occasionally produced. After some time, varying with the size and shape of the body, the acute suffering ceases and pain is only experienced during deglutition.

If the impacted body is low down, which is frequently the case when it is small, it is only at this time that its true location can sometimes be established, the sensations before this being misleading. But the pain even at this time may only indicate the location of a lesion produced by a rough or sharp body during its passage to the stomach.

Left *in situ*, foreign bodies always tend to create local lesions, unless, as sometimes happens, spontaneous expulsion occurs after the primary local irritation and the general excitement of the patient has ceased. Local inflammation is caused, the tissues become softened,

abscesses arise which may burrow in various directions, sometimes reaching into the pleura, the pericardium, the mediastinum, or the larger vessels, including even the aorta. The foreign body itself may follow either of the channels formed and cause death by reaching any of the organs of the thoracic cavity. Needles particularly are prone to migrate in various directions and sometimes appear at a spot quite remote from the gullet and totally disconnected with it as to continuity of tissue.

Small bodies that pass into the stomach seldom give rise to trouble, being usually passed *per anum* a day or two later. In one of my cases, a child three years of age, the foreign body was a screw one and a half inches in length. It was passed on the third day without having caused the least discomfort.

Treatment.—It is important to bear in mind, in all such cases, that a scratch or erosion of the mucous membrane produced by a passing angular bone—a fish-bone, a pin, etc.—gives rise to symptoms simulating the actual presence of such a body. It is quite difficult at times to convince the patient that there is nothing in his gullet.

Cases in which dyspnœa is a symptom demand immediate assistance. I have found this to be afforded most promptly by passing the index and middle fingers of the right hand into the mouth (which makes it possible to reach farther down than when one finger is introduced) and inserting the *middle* finger into the *left* pyriform sinus. The middle finger is then passed rapidly behind the larynx. The portion of the foreign body in the œsophagus is thus reached and generally swept aside, drawing out of the larynx the part engaged in it or holding down the epiglottis. If it is impacted, the index finger is brought into use, and by

closing upon the middle finger a grasp is obtained upon the obstructing substance. In some cases the larynx is deep-seated and is reached with difficulty, but the mouth of the patient can stand considerable stretching, if need be, considering the imminent danger of death. This procedure is, of course, only applicable in cases in which the foreign body is situated in the upper part of the œsophagus and close to the larynx, but, as already stated, these alone expose the patient to immediate death.

When dyspnoea is not present, the laryngeal mirror often greatly assists in the examination of the cavities involved, and it is rare, with a good light, that a body situated not far below the larynx cannot be detected. It also assists in properly introducing and directing any instrument or forceps that may be introduced. Round and smooth articles may be pushed down with a probang when they cannot be extracted with forceps. The horse-hair probang, Graefe's coin-catcher, etc., are useful, but they must be used with gentleness. Emetics should never be used, since the contractions of the œsophageal muscles tend to force the body through the walls of the organ.

When fish-bones, meat, or meat-bones are impacted, vinegar hastens their disintegration and small quantities may be sipped. Foreign bodies that have passed into the stomach are said to be assisted in their migration through the intestinal tract by the use of mashed potatoes as food.

Irregular large bodies, tooth-plates, large bones, etc., when inaccessibly located, demand œsophagotomy (*vide supra*) or gastrotomy (see STOMACH. SURGERY OF).

Injuries of the Œsophagus.

The œsophagus is often involved in injuries inflicted with suicidal intent,

the ingestion of corrosive fluids and attempts at throat-cutting being the chief casualties of this kind met with in practice. Many accidents occur also through the accidental swallowing of acids or strong alkalies,—concentrated lye, for instance,—or a household disinfectant, such as carbolic acid, or, again, boiling tea or coffee from the spout of a vessel. A corrosive substance taken by a suicide is usually taken hastily and thrown, as it were, far back into the mouth. Spasm of the larynx usually ensues and collapse follows. The same effect is generally, however, produced in accidental cases, and the lips, the gums, or even the front part of the tongue do not always indicate the severity of the lesions produced. If death does not immediately occur from laryngeal spasm,—*i.e.*, asphyxia and shock,—severe pain is experienced and acute œsophagitis (see below) ensues. Wounds of this region due to accidents or military weapons are extremely rare, however, but one injury of the œsophagus, for instance, having been recorded during the Rebellion. The protected position of the œsophagus anteriorly and posteriorly seems to account for this, the sternum and spinal column acting as shields.

Œsophagitis.

Symptoms.—In cases arising from injury of the œsophageal tissues pain is marked, especially during deglutition, unless the traumatism be of such a nature as to completely destroy the tissues and their nervous supply, as sometimes happens when caustic acids are swallowed. Under these circumstances slight pain in the periphery of the disorganized mass is the general result. The pain usually experienced is continuous and dull, and usually follows the long axis of the sternum, extending to the back and neck. Motions of the head or

shoulders sometimes aggravate it. At times it is burning, especially if the lesion is not deep-seated and when regurgitation of the acid gastric contents occurs. Spasm is frequent in such cases. A sensation suggesting the presence of a foreign body is complained of.

After a lapse of time, varying with the gravity of the injury, hæmatemesis may occur, owing to the contraction of the muscular supply around the ulcerated areas that are undergoing the process of repair; but this is generally of short duration. Large quantities of mucus and muco-pus are often voided.

The sequelæ of these cases are usually serious. Even after slight injuries, sometimes, cicatricial stenosis occurs that leads to œsophageal stricture.

The presence of blood in the food and localized pain suggest that a foreign body may be present when no other clear indication is furnished by the history. This form often becomes phlegmonous and is usually attended by a febrile reaction. Pseudomembrane may also be vomited: indicative of the form of stenosis present. Thrush, it must be remembered, may be attended by no other symptom than impediment to the passage of food.

In some cases the local inflammatory symptoms—difficult deglutition, the muco-purulent discharge, etc.—continue for some time. Such cases are termed *chronic œsophagitis* by some authors.

Diagnosis.—In traumatic cases the history and the symptoms render the diagnosis easy. The location of the pain usually points to the seat of the lesion; this may be verified by the passage of the œsophageal sound: a dangerous procedure in severe injuries. In acute œsophagitis occurring in the course of febrile diseases a condition with which it may be confounded is the irritation

following repeated vomiting of acid substances. The discomfort resulting from this, however, is of short duration, while the symptoms of true œsophagitis are continuous and more marked.

Etiology.—Almost all cases of acute œsophagitis are due to mechanical and chemical irritation or destruction by caustic acids, hot liquids, and foreign bodies. Cases due to the ingestion of acids are often met in connection with attempts at suicide, while the two latter exciting factors usually come into play accidentally. Carbolic acid is most frequently used by suicides, while the accidental agents are boiling liquids, concentrated lye, and spicules of bone.

Acute inflammation also occurs as a complication of infectious fevers, typhoid fever, typhus, pneumonia, pyæmia, small-pox, etc., while pseudomembranous œsophagitis may be caused by extension of a disease, such as diphtheria, in which a false membrane is present. Various pharyngeal disorders complicated with abscess may also extend to and involve the œsophagus in the inflammatory process. Malignant neoplasms, especially carcinoma, of the œsophagus may be accompanied by acute œsophagitis. Among the rare causes are: the prolonged administration of tartar emetic (Laennec), vertebral abscess, laryngeal perichondritis, and hysteria.

It is occasionally met with in sucklings without explainable cause.

Pathology.—Desquamation of the epithelium and erosions are present when comparatively mild caustics or strong solutions of them have been swallowed, but, when such agents as pure carbolic acid, concentrated lye, etc., have been taken, the entire mucous lining may be deprived of its epithelium. It then becomes greatly swelled, and purulent infiltration usually follows the primary

serous infiltration. The mucous layer may thus be detached from the underlying tissues. Foreign bodies may also cause deep-seated lesions and be surrounded by a cushion-like mass, causing temporary œsophageal stenosis. Gangrene occasionally follows, necrotic masses being ejected, generally with vomitus. The local disorder occurring as complication of fevers, etc., is usually less marked, though diffuse purulent inflammation occasionally occurs.

Treatment.—Beyond the relief of pain by means of hypodermic injections of morphine there is but little to do in this condition. In cases due to the ingestion of chemical agents the antidotes indicated under each special head are, of course, to be used if the case is seen sufficiently early, but, for the lesions themselves, the administration of demulcents,—the white of egg, for instance,—sips of ice-water, etc., represent about the only means at our disposal. When deglutition causes severe pain, or there is reason to believe that there is much tissue-destruction, it is best to feed the patient entirely by the rectum.

After injuries of the œsophagus cicatricial contraction is a normal sequel. This should be prevented by the use of bougies. The technique of this procedure is given below.

Stricture of the Œsophagus.

Symptoms.—Narrowing of the œsophageal lumen—whether due to cicatricial contraction or to tumors, intramural or extramural; aneurisms, etc.—is attended by gradually-increasing difficulty in swallowing, referable, in the majority of instances, to a particular spot under the sternum. At first solid food is passed with increasing difficulty, and the patient finds it necessary to masticate with great care or swallow smaller boluses. A feeling of pressure is usually experi-

enced as the food gravitates downward, which in some cases enables the patient to gauge the steadily-decreasing rapidity with which the food reaches the stomach. Later on these masses require the assistance of fluids, and finally only the latter can pass with ease.

The first effort at swallowing at a meal is generally the most arduous, the subsequent boluses passing with comparative ease. Various motions of the head are resorted to by the patient in the vain hope to assist the act of deglutition. As the difficulty increases, the patient gradually becomes weakened and emaciated through deficient nutrition.

In stricture due to cancer the contraction is rapid and death from pneumonia is not uncommon. When this does not occur, the tissues around the œsophagus are gradually implicated by extension, and death occurs from marasmus due to general toxæmia, this being greatly encouraged by starvation. The sense of hunger, however, is not acute. The vomited materials are often tinged with blood, and the general facies of the patient soon serve to indicate the presence of a malignant neoplasm. Glandular infiltration occurs late in the disease.

Diagnosis.—Certain destructive points serve to locate the seat of the stricture. Regurgitation of the food usually occurs immediately when the stricture is situated near the upper orifice. That the rejected food has not reached the stomach can easily be recognized by the absence of the characteristic odor. The material ejected is also alkaline instead of strongly acid: a valuable diagnostic feature. When the narrowing is low down the œsophagus is dilated above, and the food is accumulated in the pouch-like cavity formed. Regurgitation, instead of occurring promptly after the ingestion of food, only takes place

several hours later, and is mixed with considerable mucus. Here, again, the material ejected is not acid, having failed to reach the stomach. The accumulated food sometimes causes dyspnoea by pressing upon the trachea.

Auscultation of the œsophagus may sometimes be employed with advantage; provided, however, the examination be conducted in a very quiet room. The stethoscope is usually employed, but direct application of the ear along the left of the spine—while the patient brings his shoulders as close together anteriorly as possible—is far more satisfactory. A peculiar irregular wave-like bruit is heard when liquid is swallowed, followed by a second splashing sound as the fluid reaches the stomach. When a stricture is present the wave-bruit and the splashing sound are varied in proportion, the latter being absent in some cases of advanced constriction or replaced by repeated splashes following one another more or less in rapid succession.

Far more precise, however, is the information acquired by means of the œsophageal sound—especially the graded, olive-tipped, flexible bougie. The patient being placed upon an ordinary chair (avoiding one with a high back), the physician stands behind him. He should use his left hand as guide for the instrument, by placing it on the patient's face so as to bring the index and middle fingers over and parallel with the patient's mouth. The patient's head being thrown back, the bougie (warmed and lubricated with glycerin) should first be passed between the fingers and then introduced into the mouth perpendicularly—much as a sword-swallower introduces the weapon. The olive-tip, however, should *not* penetrate the œsophageal canal by passing *over* the larynx, but into the pyriform sinus on

either side of the larynx. Each sinus affords a funnel-like aperture which allows the bougie to glide easily into the œsophagus, without encountering the bodies of the cervical vertebræ or the cricoid cartilage. The instrument should not be forced down, but allowed to drop into the cavity by reason of its own weight.

[The present method of introducing the instrument over the middle portion of the pharyngeal wall, and therefore over the centre of the epiglottis and the posterior surface of the larynx, is defective, and accounts for the resistance usually encountered while introducing the instrument.

I have found the procedure herein described far more effective, and, when gentleness is used, far safer than that recommended in text-books. CHARLES E. DE M. SAJOUS.]

Frequently a spasm of the muscles causes the instrument to suddenly be arrested; but after a few seconds this ceases and arrest only occurs at the seat of the stricture. When this happens the instrument should be allowed to remain *in situ*; after a few moments it often suddenly drops lower down. In some cases it is advisable to first anæsthetize the pharynx and that portion of the œsophagus within reach with a 4-per-cent. solution of cocaine. When permanent arrest occurs below the larynx, the spot (gauged by length of bougie introduced) should be estimated and a slightly smaller bougie then tried. This is repeated until one is obtained that penetrates the opening—of which it affords an approximate diameter for future comparison. In some cases only narrow catgut will pass. Gum-elastic stomach-tubes may be used, but they do not afford the exact information obtained from the olive bougie. It should not be used, however, when an aneurism is known to cause the stricture.

Great care and gentleness should invariably prevail. The procedure is not devoid of danger even in the hands of an expert, softening of the tissues, especially in the low strictures, readily yielding to the pressure of the instrument.

[I have witnessed a case in which a pint of milk was thus introduced into the mediastinum, as shown by the autopsy. CHARLES E. DE M. SAJOUS.]

The presence of stricture having been determined, the history almost invariably points to its original cause. The case should be *completely* examined, however; a history of syphilis with tertiary pharyngeal symptoms may be obtained, for instance, and the stricture be ascribed to cicatricial stenosis, while in reality the true cause may be an aneurism. All the etiological factors should be borne in mind and the prevailing one determined by elimination.

In stricture due to cancer the stenosis is usually situated where the left bronchus forms a ridge in the œsophageal mucous membrane, but no portion of the canal can be said to be exempt. The vomited matter is often tinged with blood and the cancerous facies soon serves to establish the diagnosis. Emaciation is generally very rapid. The possibility that a stricture may be cancerous imposes additional care in the use of the bougie, the friability of the cancerous tissues being such as to easily yield to even slight pressure. A stricture occurring after the fortieth year in a man whose history does not present strong evidence of syphilis, tuberculosis, or local injury is usually cancerous.

Etiology.—Stricture of the œsophagus may be congenital, but it occurs, in the majority of cases, as a result of lesions produced either by the ingestion of corrosive liquids or by ulceration occurring as complication of infectious

diseases, particularly typhoid fever. Syphilitic ulceration of the œsophagus, though, is usually followed by stricture varying in degree with the location of the ulceration and the area involved. Impacted foreign bodies, masses of thrush-fungus, local tuberculosis, injuries—*i.e.*, all conditions capable of causing severe acute œsophagitis—may act as primary causes. A greatly-enlarged thyroid, an aneurism, an intramural abscess, enlarged lymphatic glands, growths of the mediastinum, etc., may also, by pressure upon the œsophagus, reduce its lumen. Cancer of the œsophagus is not an uncommon cause.

A comparatively frequent cause of stricture is squamous epithelioma: almost the only form of neoplasm encountered in the œsophagus. It is usually met with in men, and after the fortieth year.

Pathology.—The pathology of stricture varies with the cause, but in practically all cases due to local lesions, excepting cancer, the prevailing feature is the presence of cicatricial tissue. In cases originating from the ingestion of corrosive fluids the stricture is usually high, spasm of the œsophagus generally preventing gravitation of the liquid to the lower part of the organ. In all others, even syphilis, the chances are that the stricture—there is generally but one—will not be far from the lower third, or lower down. The extent of tissue involved varies frequently, and occasionally the whole lumen of the œsophagus is more or less involved and distorted. In the majority of cases in which the stricture is low, there is sacculation or dilatation of the portion above the stenosis.

Prognosis.—In cases of cicatricial stenosis the prognosis is quite favorable under appropriate treatment. Without

treatment the contraction usually reduces the lumen sufficiently to prevent alimentation, and the patient dies of slow starvation. Cases due to cancer are naturally hopeless, while the prognosis of cases resulting from the pressure of surrounding growths, aneurisms, etc., depends upon the degree of curability of the latter.

Treatment.—The aim of the treatment is obviously to restore the lumen of the œsophagus to its normal dimensions as nearly as possible, but in cancerous stricture this is hardly indicated, the neoplasm itself involving complications that bring on a fatal issue. For this reason a distinct line should be drawn between cases of stricture due to cicatricial lesions—*i.e.*, injuries, syphilis, tuberculosis, etc.—and those due to a malignant neoplasm. In all of the former dilatation with the bougie may be said to be required as soon as a stricture has been recognized; in cancerous stricture the procedure should not be resorted to. It but inflicts severe suffering upon the patient and involves additional risk.

Cicatricial stricture may be expected in all serious injuries of the œsophagus. Hence, after an accident or a local disorder known to be followed by cicatrization, stenosis should be prevented by dilatation with bougies employed in the manner indicated under DIAGNOSIS. Dilatation should be begun as soon as there is a reasonable evidence that an ulcerative process no longer exists, and be repeated daily, beginning with a medium-sized tube and ending with one representing the normal diameter of the œsophagus. The surgeon should not wait until symptoms of stenosis appear, since this often occurs only after considerable narrowing of the lumen. In some cases stenosis returns as soon as

the bougies are not introduced, and the patient is required to personally use the instrument during the rest of his life. Whether begun early in the history of the case or late, the procedure is generally effective, but in old cases the tissues yield with difficulty and sometimes greatly tax the patience of surgeon and patient. It is sometimes necessary to begin with catgut, which can be left *in situ* until the following visit, when the smallest bougie can often be introduced. The catgut does not prevent the passage of liquids and the patient can be fed as usual. As large a bougie as the stricture will admit is then introduced every day, and a larger one substituted every few days until the largest number is easily passed and retained several hours daily.

Permanent tubage of the œsophagus, introduced by Symonds, of London, has won much favor. The tubes are “from four to six inches in length and are made of gum elastic upon a silk web, the outside and inside being as smooth as possible. The upper end is funnel-shaped so as to rest upon the face of the stricture, and slightly flattened on one side (that it may not press unduly against the back of the cricoid) and the margin is perforated in two places for the attachment of a silk thread. The other end is hollow, with a lateral opening. The tube can be introduced upon a bougie, but it is more easily managed with a proper whalebone guide set in a suitable handle. The exact site of the stricture is ascertained first and marked upon the guide; the greatest gentleness must be used, and as soon as the point enters the narrowed part the tube is slowly pushed onward until the resistance to the funnel is felt; the guide is then withdrawn and the silk thread attached to the tube tied around the ear or fastened with strapping. A tube of

this kind can be left for two or three months without being changed, the patient swallowing liquid food through it. As a rule, however, it is necessary to remove the first after three or four days, as the stricture always dilates to some extent, and sometimes this must be repeated. Even if it should slip through, it will pass *per anum* or remain lodged in the stomach without inconvenience" (Mansell-Moullin). This method is said to be devoid of risk to life, and a sufficient amount of food can readily be ingested.

When these short tubes cannot be used or when they cause cough during deglutition Krishaber's or Morell Mackenzie's long tubes, or, better still, a long, catheter-like rubber tube can be employed and left *in situ* several days at a time.

Operative procedures are sometimes resorted to.

Internal œsophagotomy, an operation based on that of urethrotomy, wherein the cicatricial bands are cut, has not given the satisfactory results claimed for it. It is only warranted in cases of annular stricture. (Œsophagostomy is preferred when the stricture is high enough to be reached through the side of the neck, the incision being made between the pharynx and larynx on the left side, toward which the œsophagus leans in this region. The trachea then finds itself on one side of the incision and the carotid sheath on the other. The location of the stenosis having been determined, it is as nearly as possible made to correspond with the upper part of the incision, which should also include the œsophagus. Sometimes the omo-hyoid must also be incised. A rubber tube is then introduced, and the permanent fistula formed serves for its easy introduction and withdrawal. The patient can thus be easily fed, the tube passing

under the stenosis. The operation is not an easy one, owing to the proximity of large vessels and other easily-wounded structures.

In cancerous stricture it is inadvisable to pass bougies, as already stated; but a soft-rubber catheter with large fenestra, passed every other day or oftener, often serves to keep the passage open. It may also be left *in situ* and serve for the introduction of liquid food. Rectal feeding should be resorted to when œsophageal alimentation becomes impossible, but when rectal feeding in turn becomes insufficient—which often happens when continued several weeks—gastrotomy should be resorted to. Through the opening thus obtained to the interior of the stomach it is possible to very satisfactorily supply the patient with all the food he requires. The improvement is usually rapid, and comparative comfort is insured until the toxic effects of the neoplasm bring on death. (See STOMACH, SURGERY OF, for the details of the operation.)

Dilatation of the Œsophagus.

Etiology and Symptoms.—Dilatation of the œsophagus may be congenital, as stated, but in the majority of cases it occurs as the result of stenosis of the lower end of the tube, which, by its resistance to the passage of food, causes its accumulation in the œsophageal canal. To compensate for this the walls become greatly hypertrophied. This condition is followed, as elsewhere, by softening, which in turn causes the canal to yield to the pressure of its contents, and to become greatly enlarged.

Generally, small quantities of food are passed into the stomach at a time, and the pouch-like cavity becomes gradually emptied between meals. But regurgitation occurs when this process is too slowly performed, and the frequent

invasion of the larynx by the food thus brought up causes strangling and cough, besides the dysphagia experienced.

The bougie may be used to advantage, the large dimensions of the cavity and the narrow orifice met below being characteristic. Side-pouches may cause the sound to be arrested if it is not introduced perpendicularly or if distension of the canal is present.

Treatment.—Contraction of the dilated organ may sometimes be facilitated by introducing a long rubber tube or bougie and using it as the only avenue for the introduction of food into the stomach. Symond's tubes are too short for this purpose, and an arrangement based on the principle of the stomach-tube or a large rubber catheter is necessary. These may be introduced with the bougie or after the stricture has been enlarged. Galvanism and strychnine tend to cause contraction in incipient cases. The main object in all, however, should be to insure adequate alimentation. In advanced cases gastrostomy has proved of great value.

Tumors of the Œsophagus.

Carcinoma.

Symptoms.—Cancer of the œsophagus is rather frequently met with, and is attended by progressive stenosis, as already stated under the head of STRICTURE OF THE ŒSOPHAGUS. In some cases, however, the facies of the patient and cachectic symptoms denoting the involvement of other organs are first to appear. Pain is marked early in the cases; later on the tissue-destruction involves the nervous supply, and the pain is no longer experienced. Slight hæmorrhages may occur at this stage, though streaks of blood may have already been noted in the vomited matter. The cancerous process is then apt to invade the surrounding organs,—the larynx, the tra-

chea, the bronchi and lung, the pleura, the pericardium, and the larger vessels,—causing fatal hæmorrhage. The cervical glands are often enlarged. The vertebræ may be included in the destructive process and involvement of the cord, with paralytic symptoms, appear. Paralysis of the larynx may also occur through pressure on the recurrent laryngeal. Progressive emaciation begins early in the history of the case and death from exhaustion finally supervenes.

Diagnosis.—Progressive stenosis is a feature of all cases of stricture; hence the diagnosis must be based upon other symptoms. When the facies of the patient, a family history of cancer, and absence of local injury, syphilis, or tuberculosis can be recorded in a patient aged over 40 years, the likelihood that cancer is present is very great. Ejecta of portions of the mass will then reveal the characteristic histological features of cancer.

In the majority of cases, however, such clear signs cannot be obtained. Then pressure from a growth external to the œsophagus must be excluded; an aneurism, an enlarged gland, etc., may, as shown, cause stricture. If the stenosis is near the larynx it is rarely cancer, but a cicatricial stricture or an impacted foreign body. The auscultation test described may be employed and also the œsophageal bougie, but the latter must be used with extreme care. (See STRICTURE.)

Etiology and Pathology.—Almost all cases of cancer encountered in the œsophagus are of the squamous-epithelioma variety, the growth starting from the pavement-epithelium of the mucous membrane, most frequently in that of the lower third of the organ. It gradually invades the mucous membrane, and, progressing laterally, the lumen of the

cavity is soon reduced by a ring-like neoplasm. Later, the deep tissues become involved and the epithelioma, if the patient lives long enough, may extend to any of the important organs of the thoracic cavity.

Cancer occurs especially in males over 40 years of age. An inherited predisposition and an exciting cause—such as the prolonged use of alcohol, strong condiments, or an ulcer—are thought to afford the necessary conditions for its development.

Treatment.—This has been considered under the head of STRICTURE.

Neuroses.

Spasm of the Œsophagus (Œsophagismus).—**SYMPTOMS.**—Spasmodic contraction of the muscles of the œsophagus comes on suddenly, several attacks occurring in quick succession or intermittently, efforts to suppress them by swallowing saliva or food usually bringing them on. Deep-seated cramp-like pain is experienced during the spasm in the majority of cases. Food on its way down to the œsophagus may be regurgitated if still near the larynx; if below this it is retained *in situ*, until the spasm has passed. The attacks may last but a few hours and recur only after months' intervals; again, they may be persistent and render proper alimentation of the patient impossible without recourse to auxiliary means. Solids can, as a rule, be swallowed.

DIAGNOSIS.—The constriction usually occurs near one of the extremities of the œsophagus, but it may not be limited to these regions in succeeding attacks. Hysteria and other neuroses can usually be detected, especially in females, for whom the disease shows a predilection. The bougie may be used advantageously to distinguish œsophagismus from the organic lesions already described. In

spasm the instrument will encounter a stenosis during the active stage and pass down freely while no spasm is present.

ETIOLOGY.—Spasm of the œsophagus is the manifestation of a general neurosis, particularly hysteria, and is therefore observed in young females. It may occur as a symptom of tetanus, rabies, epilepsy, chorea, and other neuroses, and as a result of violent emotions,—fright, joy, etc. It may also be associated reflexly with pregnancy, and with disorders of the genital system, or of other organs, especially the neighboring ones,—the pharynx and the stomach. It often attends the various organic diseases of the organ itself.

TREATMENT.—Cessation of an attack is easily effected, in the majority of cases of hysterical œsophagismus, by means of antispasmodics,—the bromides, valerian, asafoetida, etc.,—but the first of these should only be used temporarily. The mere passage of the sound in these cases is often sufficient to arrest an attack. In all other forms the same remedies, with, in severe cases, hypodermic use of ether, atropine ($\frac{1}{120}$ grain), or morphine, if pain is present, are indicated during the access, constitutional treatment being instituted to counteract the causative disorder. In persistent cases the patient may require alimentation through the tube, and other measures outlined under STRICTURE.

Paralysis of the Œsophagus.—**SYMPTOMS.**—Paralysis of the œsophagus is rarely met with. There is functional inactivity of the muscular coat of the œsophagus and great difficulty is experienced in swallowing, the bolus remaining *in situ* if at all large. Liquids pass down with ease and are used by the patient to “wash down” small masses of solid food. The accumulation of food in the œsophagus often engenders dila-

tation, and the symptoms of the latter disorder are the predominating ones.

ETIOLOGY.—Paralysis of the œsophagus is usually due to extensive bulbar paralysis and other central nervous disorders. But it may also occur in a complication of peripheral disorders, especially diphtheria, enlarged lymphatic glands, and of syphilis, alcoholism, plumbism, etc.

TREATMENT.—The treatment indicated is that of the causative disorder. In diphtheritic paralysis arsenic is most effective. After a course of this remedy hypodermic injections of strychnine are often effective. Faradism, the negative pole in the sulcus directly in front of the sterno-mastoid and the positive back of the neck, may be simultaneously employed.

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OLIVE-OIL.—Olive-oil (oleum olivæ, U. S. P.) is a fixed oil expressed from the ripe fruit of *Olea Europæa* (nat. ord., *Oleaceæ*), or olive-tree, indigenous to the countries bordering upon the Mediterranean, but cultivated in all the semi-tropical countries of the world. It is yellow or greenish-yellow in color, has a sweetish taste, and is almost devoid of odor. The greenish-yellow-colored oil is considered the most delicate, and is rarely an article of export. The best, or virgin, oil is obtained from the crushed, ripe fruit, by expression without heat; a second grade is obtained by the addition of hot water to the same crushed fruit and a second expression. From the residue, after boiling, an inferior grade is made by means of very strong pressure. The best is nearly tasteless, and without color, the second has more taste and color, and the third is dark and more

or less rancid, with strong odor. Olive-oil is one of the ingredients of lead plaster and of diachylon ointment, and is also used in the preparation of liniments and cerates. Olive-oil is soluble in ether, chloroform, and carbon disulphide, and partly in water.

Therapeutics.—Olive-oil is a lubricant, laxative, and nutrient. Internally and by enema it is given for constipation, in doses of from $\frac{1}{2}$ to 6 ounces. It is a useful remedy in all forms of irritant poisoning, except that by phosphorus. In increasing doses from $\frac{1}{2}$ to 3 ounces it has caused the disappearance of obstructive jaundice. It has been used in the treatment of gall-stone, hepatic, and lead colic in doses of 3 to 6 ounces.

Twenty-one cases collected from literature in which gall-stones were treated by the use of oil. Of this number, 19 were improved or cured; in the other 2 the treatment failed. Three personal cases added in which the administration of repeated doses of $3\frac{1}{3}$ to 6 ounces of olive-oil, combined with a little menthol, produced the best results. S. Rosenberg (Ther. Monats., Dec., '89).

Literature of '96-'97-'98.

Two cases of hepatic colic treated with large quantities of olive-oil. Pain was relieved at once and the calculi were rapidly discharged. It is believed that the oil not only soothes the irritated mucous membrane and relieves spasm in this way, but may even enter the common duct when this is blocked and there is no descending current of bile, and may thus reach the stone and aid in its passage by its local action on the mucous membrane. Barth (Med. Week., Dec. 17, '97).

Olive-oil is a useful application to the skin in scarlatina and other eruptive diseases, as it seems to assist desquamation and prevents the dissemination of the scales.

Olive-oil has been used by inunction,

or as an article of diet, in wasting diseases. For this purpose it is much inferior to codliver-oil. It has recently been used hypodermically as a nutrient to supplement or replace codliver-oil in case of needed rectal alimentation.

Literature of '96-'97-'98.

Five cases experimented upon with hypodermic injections of olive-oil (one-half ounce at a time) to test its value as a nutrient. In all the cases there was more or less marked saving in the nitrogen eliminated, and a notable increase in weight and improvement in the general condition.

In one case after thirty injections small nodules containing a drop of oil were found in the lymphatics at the site of injection. The nutritive value of these hypodermic injections is higher than that of rectal or vaginal nutritive enemata. No inconveniences followed the use of the olive-oil injections. Fornace and Micheli (Rif. Med., July 14 and 15, '97).

More than five hundred subcutaneous injections of olive-oil, all made in twenty-eight patients, with never any unfavorable results, the oil being always carefully sterilized and injected with an instrument which could be fully sterilized. Injections should be made very slowly, always using a very low pressure. Amount used varied from 1 drachm up to 1½ ounces. Conclusions that the fat was absorbed and was made use of in the body-economy, it was not excreted by the urine, and it seems to have prevented loss of nitrogen. This subcutaneous administration of fat should be used when there is great loss of body-fat. Du Mesnil de Rochemont (Deut. Arch. f. klin. Med., Apr. 7, '98).

Externally olive-oil is a soothing application to burns, wounds, and raw surfaces. Dropped into the ear, it is a useful means for expelling insects that may have found their way thence. It is also a valuable addition to poultices, as it increases their emollient properties.

OPIUM AND DERIVATIVES. —

Opium (U. S. P.) is the concrete, milky exudation obtained by incising the unripe capsules of *Papaver somniferum* (nat. ord., *Papaveraceæ*), or white poppy-plant, which is indigenous to Asia Minor, but is now grown in many other parts of the world. It occurs in moist semi-solid chestnut-colored masses, or lumps, with an earthy, narcotic odor and a bitter taste. The crude drug should contain not less than 9 per cent. of crystalline morphine; when dried or powdered it should contain not less than 13 per cent. nor more than 15 per cent. of morphine.

The principle properties of opium are extracted by water, alcohol, and by dilute acid, but not by ether.

The chemical composition of opium is very complex. Seventeen alkaloids have been found in it, also meconic and lactic acids, and meconin, meconoisin, and porphyroxin, neutral substances, and glucose. The alkaloids found in this drug are morphine, codeine, narcotine, thebaine, narceine, papaverine, pseudomorphine, laudanine, hydrocotarnine, cryptopine, protopine, codamine, rhœadine, meconidine, laudanoline, lanthopine, and gnoscopine.

MORPHINE (at least 9 per cent. in crude opium) is the principle narcotic constituent. It occurs in white prisms of silvery lustre and bitter taste, and is soluble in amyl-alcohol, in 300 parts of alcohol, in 4000 parts of ether, and in 5000 parts of water. It unites with the acids to form soluble salts.

Morphine acetate occurs as a yellowish-white powder, which turns brownish and loses acetic acid with age. It has an acetic-acid odor and is soluble in 2½ parts of water.

Morphine hydrochlorate occurs in white, crystalline squares, or fine, white

needles, having a bitter taste, and is soluble in 24 parts of water and in 62 parts of alcohol.

Morphine meconate, or bimeconate, is the form in which most morphine exists in opium; it occurs as a feeble yellowish-white, crystalline powder, which is soluble in alcohol and in 25 parts of water and is reputed to produce a less agreeable effect upon the brain, stomach, and intestines than the other salts.

Morphine sulphate, the salt most used in the United States, occurs in fine, white, crystalline needles, of silky lustre and bitter taste; it is soluble in 21 parts of water and in 702 parts of alcohol.

CODEINE (0.5 per cent. in crude opium) possesses about one-half the narcotic strength of morphine, but is more calmative. It occurs in colorless, bitter, alkaline crystals, which are soluble in alcohol, ether, benzene (benzol), carbon disulphide, and in 80 parts of water. It is chiefly used as a calmative in diseases of the respiratory organs, as an hypnotic, and against pains of moderate or slight severity. It forms salts with the acids, but the alkaloid itself is generally used. The phosphate is soluble in 4 parts of water and is the best for hypodermic use, as it is more soluble and less irritating than the other salts.

APOCODEINE is a derivative of codeine, having expectorant and emetic properties. It occurs as a reddish-brown, amorphous powder, soluble in ether, alcohol, and chloroform. Apocodeine hydrochlorate occurs as a yellow-gray, very hygroscopical powder, freely soluble in water. Apocodeine acts like codeine, but is weaker; it produces a marked increase in the salivary secretion and an accelerated peristaltic action of the bowel. It is used as an expectorant and sedative in chronic bronchitis and other bronchial affections.

NARCOTINE (2 to 10 per cent. in crude opium) has no narcotic effects, but is an antiperiodic. It has very weak basic power, forming, however, a sulphate and hydrochlorate, which occur in white or yellowish-white, amorphous powders, soluble in water.

THEBAINE, OR PARAMORPHINE (less than 0.25 per cent. in crude opium), is a spinal convulsant. It occurs in white, lustrous crystalline scales, having a sharp, styptic taste, and is soluble in 10 parts of chloroform and in 140 parts of ether. It is very poisonous. The tartrate is freely soluble in water; the hydrochlorate is soluble in 15 $\frac{1}{2}$ parts of water.

NARCEINE (0.02 per cent. in crude opium) occurs in very fine small, feather-like needles, which are soluble in alcohol and in hot water. It forms salts, but the alkaloid is generally used. It is used like morphine; its action, though similar to that of morphine, is milder and free from disagreeable after-effects.

PAPAVERINE (1 per cent. in crude opium) is a narcotic and sedative used principally in the diarrhoea of children. It occurs in white prisms, soluble in alcohol, ether, and chloroform. It forms the usual salts with the acids.

PROTOPINE, according to Engel (Gaz. Méd. de Paris, Oct. 11, '90), acts similar to camphor, death occurring, after poisonous doses, from respiratory paralysis.

LAUDANINE appears to act principally upon the spinal cord, causing at first tetanus and afterward paralysis (Fubini and Benedicenti).

APOMORPHINE is a derivative of morphine, devoid of narcotic effect; it is an emetic, expectorant, and cardiac depressant. (See "APOMORPHINE," volume i.)

DIONIN is a new morphine derivative, recommended by Hesse (Pharm. Centrall., xl, p. 5, '99). It is the hydrochlorate of morphine mono-ethyl-ether,

or ethyl-morphine. Dionin is serviceable, therapeutically, because it affords neutral solutions which may be advantageously employed subcutaneously. It is soluble in about 7 parts of water, in about 1.4 parts of alcohol, and in about 20 parts of syrup, while it is insoluble in ether and in chloroform.

HEROIN constitutes another new derivative (Dresser, *Le Bull. Méd.*, Oct. 5, '98). If acetyl groups are substituted for the two hydroxyl groups of morphine, heroin is produced. Its sedative action on the respiration is said to be more powerful than that of morphine and codeine. The fatal dose of heroin is 100 times the efficacious dose, while the fatal dose of codeine is only 10 times the efficacious dose. Heroin has very little convulsive action.

Comparative study made in animals and man, of the action of the various alkaloids of opium. Next to morphine, papaverine exerted the most sedative influence upon the movements of the bowels; narcotine was below papaverine in activity; narceine and codeine proved entirely ineffective; thebaine acted as an intestinal stimulant. The administration of papaverine, in doses of from $\frac{1}{6}$ to $\frac{1}{2}$ grain, subcutaneously or by the stomach, to individuals whose bowels had previously acted normally, was followed by no constant results. In some persons transient constipation was induced; in others no apparent influence was exercised upon the bowels. In adults with diarrhœa the results were not more conclusive. In children, however, better results were obtained, even large doses occasioning no disturbance of consciousness, respiration, circulation, or appetite. Leubuscher (*Wiener med. Presse*, No. 14, '92).

Preparations and Doses.—Opium preparations in solution are precipitated by the solutions of many metallic substances in the form of an insoluble meconate (*e.g.*, lead-water and laudanum). The alkaloids in solution are precipitated by

the addition of an alkali or of tannic acid. The presence of a small portion of glucose in opium makes it incompatible with nitrate of silver, and pills containing them in combination may explode.

OFFICIAL SOLID PREPARATIONS.—*Emplastrum opii* (extract of opium, 6 per cent.).

Extractum opii (18 per cent. morphine), $\frac{1}{4}$ to $\frac{1}{2}$ grain.

Opii pulvis (13 to 15 per cent. of morphine), $\frac{1}{2}$ to 2 grains.

Opium (at least 9 per cent. morphine), $\frac{1}{4}$ to 2 grains.

Opium deodoratum (14 per cent. morphine), $\frac{1}{2}$ to 2 grains.

Pilulæ opii (powdered opium, 1 grain), 1 pill.

Pulvis ipecacuanhæ et opii (Dover's powder—ipecac and opium, each, 1 part; milk-sugar, 8 parts), 5 to 15 grains.

Trochisci glycyrrhizæ et opii (Wistar's cough-lozenges—extract of licorice, 2 grains; extract of opium, $\frac{1}{20}$ grain; acacia, sugar, oil of anise, of each, a sufficient quantity), 1 to 10 troches.

OFFICIAL FLUID PREPARATIONS.—*Acetum opii* (vinegar of opium, or black drop—10 per cent. opium), 5 to 20 minims.

Mistura glycyrrhizæ composita (brown mixture—extract of licorice, sugar, acacia, of each, 3 parts; paregoric, 12 parts; antimonial wine, 6 parts; spirit of nitrous ether, 3 parts; water, 70 parts), 1 to 4 drachms.

Tinctura ipecacuanhæ et opii (fluid Dover's powder—1 per cent. ipecac; 10 per cent. opium), 5 to 15 minims.

Tinctura opii (laudanum—10 per cent. opium), 1 to 20 minims.

Tinctura opii camphorata (paregoric—0.4 per cent. opium), 1 to 4 drachms.

In the use of opium in the diseases of children the dose varies greatly and no positive rules can be given. It is comparatively small, especially for children

under 8 months. As a general rule, 1 minim of paregoric (equivalent to 2 drops) may be given for each month of the baby's age. At 1 year $\frac{3}{4}$ minim of the deodorized tincture is a full dose, or $\frac{3}{4}$ grain of Dover's powder. Morphine is rarely indicated at this age. The dose should not exceed $\frac{1}{120}$ grain when given hypodermically. The initial dose of opium should be small, and its effect should be noted before it is repeated. F. M. Crandall (Gaillard's Med. Jour., Nov., '94).

Tinctura opii deodorati (McMunn's elixir, or deodorized laudanum—10 per cent. opium), 1 to 20 minims.

Vinum opii (Sydenham's laudanum—10 per cent. opium), 5 to 20 minims.

OFFICIAL PREPARATIONS OF THE ALKALOIDS OF OPIUM.—Apomorphinæ hydrochloras (derivative of morphine), $\frac{1}{16}$ to $\frac{1}{8}$ grain.

Codeina (alkaloid), $\frac{1}{4}$ to 3 grains.

Morphina (alkaloid), $\frac{1}{16}$ to $\frac{1}{4}$ grain.

Morphinæ acetas, $\frac{1}{12}$ to $\frac{1}{2}$ grain.

Morphinæ hydrochloras, $\frac{1}{12}$ to $\frac{1}{2}$ grain.

Morphinæ sulphas, $\frac{1}{12}$ to $\frac{1}{2}$ grain.

Pulvis morphinæ compositus (Tully's powder—morphine sulphate, 1 part; camphor, licorice, and calcium carbonate, of each, 20 parts), 5 to 15 grains.

Trochisci morphinæ et ipecacuanhæ (morphine, $\frac{1}{40}$ grain; ipecac, $\frac{1}{12}$ grain), 1 to 6 troches.

NON-OFFICIAL SOLID PREPARATIONS.—Apocodeina (alkaloid and hydrochlorate), 3 to 4 grains daily (in divided doses).

Confectio opii (U. S. P., 1870—powdered opium, 1 part; aromatic powder, 12 parts; honey, 28 parts), 10 to 20 grains.

Narceina (alkaloid), $\frac{1}{4}$ to $\frac{3}{4}$ grains.

Narcotinæ hydrochloras, 2 to 10 grains.

Papaverina (alkaloid), $\frac{1}{12}$ to $\frac{3}{4}$ grain (to a child).

Papaveris capsulæ (poppy-capsules—strength variable).

NON-OFFICIAL FLUID PREPARATIONS.—Liquor morphinæ bimeconatis (B. P.), 5 to 40 minims.

Liquor morphinæ sulphatis Majendie (16 grains to fluidounce), 3 to 10 minims by hypodermic injection.

Mistura magnesiæ et asafoetidæ (De-wee's carminative—magnesium carb., 5 parts; tincture of asafoetida, 7 parts; tincture of opium, 1 part; sugar, 10 parts; water, to make 100 parts), $\frac{1}{2}$ to 4 drachms.

Mistura opii et ipecacuanhæ compositus (Swedish cholera drops, or Thielemann's cholera drops), 1 to 2 drachms.

Morphinæ oleatum (10 per cent. morphine), for external use.

Oleum papaveris seminis (poppy-seed-oil—bland oil; adulterant of olive-oil).

Syrupus papaveris (syrup of poppy-capsules—strength variable).

Syrupus rhœados (syrup of red poppy-flowers—non-narcotic), used as vehicle.

Tinctura chloroformi et morphinæ, B. P. (chloroform, 1 $\frac{1}{4}$ minims; ether, $\frac{1}{3}$ minim; alcohol, 1 $\frac{1}{4}$ minims; morphine hydrochlorate, $\frac{1}{48}$ grain; dilute hydrocyanic acid, $\frac{5}{8}$ minim; oil of pepper-mint, $\frac{1}{80}$ minim; fluid extract of licorice, 1 $\frac{1}{4}$ minims; treacle and syrup, to make 10 minims), used externally.

Physiological Action.—One of the main factors in the physiological action of opium is its inhibitory influence upon tissue-waste. The reduced elimination of urea and other waste-products attending its use tend to practically sustain the results of experimental researches. Its baneful influence upon gastric digestion and intestinal action is, in part, due to this effect, which involves depression of motor activity. The slowing of the pulse noted is at present ascribed to stimulation of the pneumogastric, and

therefore of the inhibitory powers of this nerve upon cardiac action; the drug is also credited with a stimulating effect upon the muscles of the heart itself. When a powerful dose is taken the conditions are reversed; the inhibitory influence of the vagus is counteracted, the vasomotor centres are depressed and a rapid pulse and marked depression follow. The same influence obtains upon the temperature, which may be slightly raised by small doses and lowered by large ones. Respiration follows suit, large doses of opium acting powerfully upon the respiratory centres. What its well-known influence upon the pupil depends upon is not clearly defined, but it is theoretically ascribed to its depressing effects upon the sympathetic system. The same influence upon the splanchnic nerves reduces peristaltic action indirectly, and gives rise to constipation; large doses, by totally paralyzing these inhibitory fibres, may thus totally arrest intestinal activity. A large proportion of opium when taken by the mouth is absorbed from the stomach; hence the importance of washing out this viscus in cases of acute poisoning. The intestines and kidneys are the main channels of elimination for what proportion of the drug ingested or absorbed after hypodermic use is not destroyed in the organism.

Acute Poisoning by Opium.—Acute poisoning by opium may occur by intent or accident, through an overdose of one of the official preparations of opium or morphine, but not infrequently through the careless use of certain proprietary medicines. Children, being very susceptible to the action of opium, are often profoundly affected by seemingly small and appropriate doses. Soothing syrups and carminatives containing opium have contributed their share in increasing

infant-mortality. Idiosyncrasy, in the adult, will sometimes cause profound effects to follow the administration of a moderate dose of this drug.

A full dose of opium or one of its preparations is followed by a well-defined train of symptoms. We notice first a preliminary stage of mental excitement, which is accompanied by a feeling of well-being and content and an acceleration of the heart's action. This is soon followed by headache, weariness, a sensation of weight in the limbs, and drowsiness. With these feelings we observe a diminished sensibility of the skin, contracted pupils, deeper and slower respiration (sometimes not more than eight to ten to the minute); slow, full pulse; suffused or even cyanotic face; and warm, dry skin. The breathing may now become puffing and stertorous. In this stage the person may be aroused by being loudly called or violently shaken; but if left alone he falls asleep at once. When the patient is aroused, the respirations become more frequent, the blood better aerated, and the duskiess of the face disappears. Death seldom, if ever, occurs in this stage from the action of the poison alone, but death may take place if a complicating disease be present.

If the dose taken be a lethal one, the symptoms increase in severity. The face becomes at first more cyanotic, then, as death approaches, pale and livid. The pupils contract to the size of a pin's point. The respirations now drop to four or five per minute, and become irregular and shallow. The pulse becomes weak and compressible; the skin cold and covered with a clammy perspiration. There is complete muscular relaxation; the lower jaw drops. The reflexes are abolished. The patient cannot now be aroused. Death occurs by respiratory paralysis, although, on account of the

asphyxia, the heart ceases its action almost simultaneously. Dilatation of the pupils is found only after death. Death, in the adult, has followed the ingestion of $2\frac{1}{2}$ grains of the extract of opium, 4 grains of powdered opium, 1 grain of morphine, and 1 drachm of laudanum. The amount that can be taken without producing death by those habituated to its use is incredible. Taylor reports the death of a child of 4 weeks of age after taking $2\frac{1}{2}$ minims of paregoric.

(For the symptoms and treatment of chronic poisoning by opium, see MORPHINISM.)

Several fatal cases of opium poisoning have, after being unconscious for a long time, opened their eyes, moved their hands, and shown other signs of returning consciousness, but died almost immediately afterward. Carl Johnson (Med. News, May 19, '94).

Case of recovery after ingestion of 20 grains of morphine and 1.8 grains of opium. Flintermann (Phys. and Surg., Nov., '93).

Case of idiosyncrasy to codeine reported. Patient was given $\frac{1}{2}$ grain internally and $\frac{1}{2}$ grain by hypodermic injection. In about an hour the patient was swelled from head to foot, face and body intensely red, as if stung by bees, and skin so hyperæsthetic that the slightest touch on any part of it caused her to cry out with pain. The lower extremities were cold and purple, with a death-like feeling, the heart-sounds feeble and irregular, and the pulse at the wrist almost imperceptible. Large doses of digitalis and whisky, with hot applications to feet and limbs, soon restored the failing circulation. In five or six hours she felt as well as if nothing had occurred. J. S. Duff (Columbus Med. Jour., June, '94).

Differential Diagnosis of Acute Poisoning by Opium.—Some cases of acute poisoning by opium bear a close resemblance to cases of uræmic coma, alcohol intoxication, and cerebral apoplexy (especially hæmorrhage into the pons Varolii). In

all these conditions we may have coma, stertorous breathing, slow respiration and pulse, and congestion of the face. The history of the case may or may not aid us. In uræmic coma there is generally more or less œdema present. The presence of albumin and casts would point to uræmia, but albumin may be present in the urine after an apoplectic seizure or an intracranial hæmorrhage, although the kidneys were in a perfectly healthy condition prior to the attack. Alcoholic intoxication may be suspected from the odor of spirits or of ethers on the breath or about the person. In alcoholic intoxication the patient can be roused and will answer questions. The pupils may be contracted in acute alcoholism, but will dilate when the patient is aroused. The possibility of double poisoning by opium and alcohol should be borne in mind. In cerebral apoplexy, except where hæmorrhage has invaded the pons Varolii, the pupils are not contracted or are unsymmetrical; there is strabismus, sometimes facial asymmetry, and usually paralysis of one limb or both. In apoplexy the onset of the symptoms is sudden, there is often no history of having taken food or medicine, and the face, although congested or pale, is not swelled and cyanosed as in opium narcosis. Hæmorrhage into the pons Varolii is rare and generally fatal; the attack is sudden and the entire body is relaxed, with involuntary evacuations of bladder and bowel, which is not usual in opium poisoning.

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In the third stage opium poisoning is sometimes differentiated with great difficulty from uræmic coma, alcoholic narcosis, cerebral hæmorrhage, and the condition following an epileptic convulsion. In uræmic coma the pupils are usually normal or dilated, but may be contracted; convulsions generally occur,

and anasarca is usually present. The urine is always loaded with albumin, and the temperature is said to be always below normal. In alcoholic narcosis the pupils are normal or dilated, the respirations are not as slow as in opium poisoning, and the pulse is slow and full. Too much dependence must not be placed upon the odor of alcohol, as the patient may have taken opium while intoxicated. An hypodermic injection of apomorphine will cause a man unconscious from alcohol to vomit, but will have no effect if the case be one of opium poisoning. In case of cerebral hæmorrhage there is usually more or less paralysis of the cranial nerves, with some differences in the reflexes of the two sides of the body, and in the size of the two pupils. In the coma following an epileptic convulsion the tongue will probably be bitten, the pupils dilated, and the respirations but little slower than normal. The history and surroundings are often more valuable aids to diagnosis than the physical condition. The occurrence of a convulsion at the beginning of the attack will exclude opium poisoning, although it may occur in anyone of the other conditions named. Carl Johnson (Med. News, Mar. 20, '97).

Treatment of Acute Poisoning by Opium.—The first indication is to empty and wash out the stomach. Emetics may be used, but large doses will be required. The stomach-siphon is preferable if it can be used. By means of it antidotes can be introduced into the stomach as soon as it is washed out. Since opium is eliminated into the stomach from the blood-vessels and then reabsorbed by it, frequent lavage of the stomach is advised. Tannic acid and permanganate of potash are chemical antidotes to opium, and a solution of one of these may be placed within the stomach by means of the stomach-siphon. Permanganate of potash, if given while the poison still remains in the stomach, will decompose the morphine. A quantity of the permanganate at least equal to the

amount of morphine swallowed should be administered, well diluted with water, as recommended by William Moor, of New York, who first suggested this valuable antidote. Many instances of success with this remedy have been reported.

One grain of morphine is decomposed by exactly 1 grain of permanganate of potassium. This should be the basis of the permanganate treatment of opium poisoning. No matter how much time has elapsed since the taking of the poison, a sufficient quantity of the antidote should be given *per os* (well diluted), or, if the patient be unable to swallow, the permanganate solution can easily be administered through the nose by means of a catheter, piece of rubber tubing, and a funnel. Hypodermically, a 1 to 15 solution can be used. The *modus operandi* of hypodermic injections of permanganate of potassium, in cases of morphine poisoning, is explained by the fact that the permanganate instantaneously selects morphine from among albuminous bodies. William Moor (Med. Rec., Feb. 17, '94).

Experiments with potassium permanganate as an antidote to morphine gave following results: (1) potassium permanganate in dilute solution, not stronger than 1 grain to 1 ounce, may be given by the stomach without danger; (2) subcutaneously it is poisonous; (3) grain for grain, it completely decomposes morphine, the decomposition occurring in acid media more rapidly than in a neutral medium; (4) foodstuffs and acetic acid do not interfere with its decomposition; (5) it is an efficient antidote if taken while the morphine is in the stomach. Graham Chambers (Can. Pract., Sept., '94).

Potassium permanganate given by the mouth directly after poisoning is a valuable, but not perfect, antidote to the morphine salts: an antidote, however, which should not be relied upon to the exclusion of mechanical or medicinal measures for emptying the stomach. H. C. Wood (Univ. Med. Mag., Aug., '94).

Case of a child, aged 18 months,

poisoned by 2 morphine pills, $\frac{1}{4}$ grain each. About 1 grain of potassium permanganate was given at once, no other agent, not even an emetic being resorted to. A second grain was given and the little patient put to bed. During the night the child had some delirium of a wild nature and had little sleep, but next day appeared none the worse for its overdose of morphine. H. B. Tingley (Med. Rec., Nov. 3, '94).

Thirty-five cases of opium poisoning in which potassium permanganate has proved its great value.

The physician should at once administer a sufficient quantity of the permanganate on reaching the bedside, while in ambulance cases the surgeon should first administer the potash salt before conveying the patient to the hospital, otherwise the jolting of the vehicle promotes the absorption of the poison. William Moor (Med. Rec., Mar. 2, '95).

Case in which the permanganate was used successfully by hypodermic injection, 3 grains being given in that way every hour until 12 grains had been given. Hayes (N. Y. Med. Rec., May 25, '95).

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Treatment of opium poisoning by permanganate of potassium employed in 19 cases, the following solutions being used:—

No. 1 solution:—

R Potass. permang., 10 grains.
Acid. sulph. dil., 2 drachms.
Aq., 1 pint.

As this does not keep well, the sulphuric acid has to be kept separately, and the quantities in the stock mixtures are so arranged that 2 drachms of the permanganate and 2 drachms of the sulphuric acid in the concentrated solution, added to a pint of water, provide the proper amount for use.

No. 2 solution:—

R Potass. permang., 2 grains.
Aq., 1 pint.

This is also kept in a concentrated stock mixture. The following instructions are carried out regarding the use of the stock solutions:—

1. The stomach is to be washed out

twice with plain water, washings being kept for chemical examination.

2. Stomach is washed out with No. 2 solution until washings come back pink, the solution being retained in the stomach for 1 minute each time.

3. The No. 1 solution is introduced and left in the stomach.

4. No. 1 solution is to be repeated twice, at intervals of half an hour.

5. Then No. 2 solution is to be given every half-hour until complete recovery.

It is better to use a tube entirely open at the stomach end—an ordinary half-inch drainage-tube answers the purpose. The amount of permanganate required depends upon the amount of drug taken. The washings must be continued until the solution returns pink. Maynard (Brit. Med. Jour., May 16, '96).

More than 90 instances of successful use of potassium permanganate in opium poisoning have been reported. Seven or 8 grains in diluted solution should be given to antidote the opium or morphine in the stomach, and this is to be followed by 1 grain in solution at frequent intervals, to antagonize the morphine subsequently eliminated by the gastric mucous membrane. The subcutaneous injection of a 1-per-cent. solution is also recommended as a physiological antidote. Moor (Ther. Woeh., No. 7, '97).

There are but three possible ways in which potassium permanganate may overcome the poisonous effects of opium: 1. Chemically, by coming in contact with the alkaloids in the blood, and thereby oxidizing them. 2. By acting as a physiological antagonist. 3. Mechanically, by giving rise to severe pain, which follows the ingestion of potassium permanganate, thereby assisting in keeping the patient awake. Experiments tried on dogs lead to most serious doubt as to the efficacy of potassium permanganate as an antidote to opium or any of its alkaloids when hypodermically injected. E. G. Thornton and C. A. Holder (Ther. Gaz., No. 1, p. 11, '98).

In morphine poisoning good effects obtained by the sodium salt are shown to be not inferior to those of the potassium salt. The stomach should be previously

washed out with a 0.2-per-cent.-sodium-permanganate solution. This should be done even if the poison have been taken some hours previously. After this, half a litre of the same solution is taken, or it may be passed through the tube into the stomach. The washing out should be repeated again in a few hours. If washing out is not possible, apomorphine should be injected, as emetics administered by the mouth interfere with the permanganate. Where the emetic must be given by the mouth, half a litre of sodium permanganate is given immediately afterward, and then another half-litre after the vomiting. The usual remedies must not be omitted if there be any evidence of absorption's having taken place from the stomach, because permanganate is of little service after the poison is absorbed. Schreiber (*Centralb. f. Inn. Med.*, June 11, '98).

Hot, strong, black coffee is useful in keeping up the respirations and averting collapse. It is usually given by the mouth, if the patient can swallow; if not, by means of the stomach-siphon or by rectal injection. If the respiration become too infrequent the hypodermic injection of strychnine ($\frac{1}{30}$ to $\frac{1}{10}$ grain) will be found useful, and may be repeated as the symptoms demand.

Alcoholic stimulants may be required. Ammonia and respiratory stimulants—amyl-nitrite, atropine, etc.—may prove ineffectual, and recourse may then be had to artificial respiration. If the surface temperature fall, external heat to the trunk and the extremities will assist in maintaining the body-heat. While opium coma does not in itself kill, the patient may in that state cease breathing, and as any method of rousing the patient will accelerate and deepen the respiratory action, it is important that the patient be kept awake by continuously walking him between two assistants or by flagellation. As death occurs by paralysis of the respiratory centres, the maintenance of respiratory action should be our chief aim,

and eternal vigilance should be observed until all danger is over.

Case of opium poisoning in a year-old child, to whom the mother by mistake administered a teaspoonful of Sydenham's laudanum. The father immediately gave the child as much milk as it could take, and afterward a tablespoonful of syrup of ipecac. The milk, coagulating in the stomach, imprisoned the laudanum and the ipecac caused it to be vomited in the curds. The child's life was thus saved without any symptoms of poisoning, absorption not having taken place on account of the coagulation of the milk. Gibert (*Union Méd. du Nord-est*, Apr., '94).

In severe cases of morphine poisoning stimulation of the phrenic nerve by the faradic current, one pole being placed at the side of the neck and the other over the diaphragm, urged. This can be kept up for hours without danger. H. T. Penny (*Med. Sentinel*, Nov., '95).

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Venesection in opium poisoning is efficacious in apparently hopeless cases, where death is impending, owing to failure of respiratory action due to distension of the right side of the heart with backward pressure. D. G. Marshall (*Indian Med. Gaz.*, June, '96).

Case of opium poisoning in which the patient swallowed a solution containing about 30 grains of morphine acetate, and was not discovered until three hours later. The pupils were contracted, pulse slow, and respirations slow and shallow. Patient rapidly grew worse, and, in spite of washing out the stomach, hypodermic injections of various stimulants, and application of faradism, cyanosis became profound, and death seemed imminent. Oxygen was then given and artificial respiration commenced; six hours later there was a slight attempt at respiration, and, at expiration of two hours more, artificial respiration was temporarily discontinued; 18 hours after the ingestion of the poison the patient was practically out of danger, and ultimately recovered. This is believed to be the largest dose followed by recovery hith-

erto recorded, considering the fact that the drug was taken upon an empty stomach, and no treatment employed for three hours. It is thought the oxygen alone saved the patient's life. D. T. Playfair (Lancet, Aug. 27, '98).

Case of accidental administration of a fluidrachm of liquor morphinæ (B. P.) to a 3-month-old baby. Within ten minutes child was seized with violent tetanic convulsions and with periodic cessation of breathing. Pupils were contracted to pin-point. Later child was comatose. Artificial respiration was continued constantly for three hours and occasionally for the succeeding six or seven. Within an hour child was given $\frac{1}{300}$ grain of atropine, subcutaneously; half an hour later $\frac{1}{150}$ grain. Twice afterward $\frac{1}{300}$ grain was administered. Strong decoction of coffee and peptonized milk were given by the rectum, and fomentations were applied to the epigastrium. Face, upper part of chest, and other accessible parts were slapped with cold, wet towels. Child opened its eyes at the end of twenty-four hours, and not before forty-eight hours would it suck from the mother. At this time broncho-pneumonia developed, from which the child recovered entirely in ten days. J. Fotheringham (Brit. Med. Jour., Oct. 22, '98).

Therapeutics.—Opium is used to relieve pain, to check inflammation and allay irritation, to produce sleep, to inhibit undue action of the organs of secretion, and to relieve the effects of systemic strain and shock. In meeting these indications it covers an extensive field—so extensive, indeed, that the reader must be referred to almost all the affections considered in this work, to properly portray its usefulness. To repeat all these indications under this head would require about fifty pages, which the editor rightly prefers to devote to new matter.

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OPTIC NERVE AND RETINA, DISEASES OF THE.

The optic nerve and the retina, forming, together, an offshoot of the central nervous system, show the closest association in their diseases, which are largely dependent on general disease and disease of other organs. Being open to inspection and minute investigation, they furnish valuable diagnostic and prognostic indications regarding the conditions with which they are associated.

Retinitis.—Retinitis is an inflammation of low grade and extremely chronic. Heat and pain are absent, redness is often confined to doubtful changes in the retinal vessels, and swelling is evident chiefly through the opacity of the exudate.

Symptoms.—Impairment of vision is the only constant rational symptom; and it is not characteristic, and tells little of the cause or gravity of the disease. In the early stages it appears as a diffuse clouding of the field of vision or some part of it. Later it may be a distortion of objects (*metamorphopsia*) or an annoying quivering of the thing looked at. In some forms the impairment of vision is greatest by a bright light: *day-blindness*. In others it is greater by feeble illumination: *night-blindness*. Flashes of light sometimes occur, but they may not be noticed at all. The important symptoms are wholly ophthalmoscopical. They include opacity of the retina, alteration of the retinal vessels, hæmorrhage, and pigment deposits and alterations.

Opacity prevents the seeing of the retinal pigment-layer, and the color or details of the choroid, which are visible through the normal transparent retina. The opacity may appear as a gray veil, faintly blurring or entirely obscuring the deeper structures, or it may have the

form of definite dirty-white or clear, glistening-white masses. Its effect on the retinal vessels varies with their depth in the retina. A vessel running on the surface of the retina is more distinctly seen than normal, because of the contrast furnished by the gray or white opacity of the retina behind it. But a portion of a retinal vessel imbedded in the retina will be partly or entirely hidden by the opacity.

The retinal vessels may be distended uniformly or irregularly. Distension renders the visible vessels larger, and more of the small vessels visible; and it also makes the vessels more tortuous. The tortuosity is shown both by the wavy outline in the plane of the retina and by more decided differences of level in different parts of the vessels; so that some parts stand out with greater distinctness, while others are comparatively buried in the depths of the retina. Irregular distension of the retinal veins occurs in retinitis, indicating disease of the retinal walls.

RETINAL HÆMORRHAGE is liable to occur in violent retinitis of any kind, causing dark-red spots in the fundus. When it takes place into the nerve-fibre layer, the blood becomes diffused in the direction of the bundles of fibres, forming what are known as "flame-shaped" patches, narrower toward the optic nerve, wider and having a "feather-edge" in the opposite direction. In time the dark-red spot of hæmorrhage disappears. It may be followed by a patch of white or a marked disturbance of pigmentation.

SUBHYALOID HÆMORRHAGES.—These are large, rounded areas of hæmorrhage, located near the posterior pole of the eye and often shifting their positions from day to day, situated between the retina and vitreous. They undergo absorption, with sometimes full restoration of vision.

Patches of retinal inflammation are often followed by atrophy of the retinal pigment-layer, or the formation of black pigment-blotches. But these only become visible when the inflammatory opacity and swelling has so far subsided as to permit a view of deeper structures.

Varieties.—SIMPLE or SEROUS, retinitis may be caused by eye-strain, choroidal inflammation, or obscure constitutional conditions. It may be limited to small isolated areas. The affected parts of the retina appear gray or bluish, with indefinite edges. It affects one or both eyes.

PURULENT RETINITIS results from injury, as a penetrating wound or the lodgment of a foreign body in the vitreous; or it may be a *septic*, *metastatic*, or *embolic* retinitis, arising in connection with pyæmia, puerperal fever, etc. It may present only small, white spots, and hæmorrhages scattered throughout the retina; or may be indistinguishable from purulent choroiditis, ending in panophthalmitis or in chronic purulent accumulation in the vitreous: *pseudoglioma*.

ALBUMINURIC RETINITIS commonly attends chronic, non-exudative, or interstitial, nephritis. (See BRIGHT'S DISEASE, volume i.) It arises when, after the period of high vascular tension, elimination is beginning to fail. It is not an early symptom, but it is often the first symptom that leads to a correct diagnosis. It may occur with the albuminuria of pregnancy. It often presents a characteristic appearance, consisting of white dots, arranged somewhat in lines that radiate from the fovea. There are retinal hæmorrhages, usually "flame-shaped," and irregular dilatation of retinal veins. The optic nerve may be involved in the inflammation. There may also be extensive masses of retinal exudate. Both eyes are commonly af-

fect. The appearance of this form of retinitis in chronic Bright's disease commonly indicates a fatal termination of the case within a year or two.

LEUKÆMIC RETINITIS occurs in leukaemia and pernicious anaemia. (See ANÆMIA, volume i.) The whole fundus may be obscured by the retinal swelling, and often has a markedly-yellowish color. Retinal hæmorrhages are numerous, and the retinal veins may be enormously dilated, while both arteries and veins are comparatively pale. Both eyes are affected.

HÆMORRHAGIC RETINITIS, or RETINAL APOPLEXY, is marked by hæmorrhages in all parts of the retina, which recur again and again. It depends on disease of the retinal vessels. Vision is greatly impaired, and hæmorrhagic glaucoma is likely to ensue. One eye is likely to be affected earlier, or to a much greater extent, than the other.

GOUTY RETINITIS occurs in elderly gouty persons. There are yellowish-white patches of exudation. The vessels are irregularly narrowed, with thickening of their walls. In the early stages there are hæmorrhages. Impairment of vision is progressive, but rarely goes on to complete blindness.

DIABETIC RETINITIS is characterized by ivory-white dots of exudation—most numerous near the posterior pole of the eye, but not grouped in any special figure—and points or larger spots of hæmorrhage. (See DIABETES MELLITUS, volume ii.)

SYPHILITIC RETINITIS is one of the late secondary lesions. It is commonly attended with choroidal disease and dust-like opacity of the vitreous. The retinal exudate may be localized, especially at the macula or in a zone around the optic disk. Vision is always permanently impaired. The optic disk may be at first

red and swelled, and later undergo atrophy, becoming yellowish in color, with narrowed retinal vessels.

PUNCTATE RETINITIS shows numerous white or yellowish-white points scattered throughout the fundus, with some impairment of vision. It is probably the permanent condition following some active disease.

CIRCINATE RETINITIS is characterized by a wreath of brilliant-white spots near the macula or the optic disk, or including both these regions. This appearance is preceded by retinal hæmorrhages. Vision is permanently impaired.

STRIATE RETINITIS.—In this form of retinitis yellow or gray lines or streaks appear in the retina. Sometimes they are straight, as if drawn upon, in other cases curved, but not conforming to any normal structure. They may follow detachment of the retina, if the detached portion resumes its normal position.

PROLIFERATING RETINITIS includes cases in which masses of opacity, probably following large hæmorrhages, extend from the retina into the vitreous humor.

RETINITIS FROM EXCESSIVE LIGHT occurs after looking at the sun without sufficient protection, as after watching an eclipse. A small central scotoma occurs, attended and followed by persistent dazzling and metamorphopsia. After exposure to the arc electric light at a short distance the same trouble may develop; but it is at first attended with smarting, burning, and swelling of the conjunctiva, probably dependent on some other effect of the electrical discharge.

RETINITIS PIGMENTOSA is a condition of retinal degeneration, usually congenital. It is characterized by night-blindness, great narrowing of the visual field, the deposit of pigment-masses in the retina, narrowing of the retinal vessels,

and atrophy of the optic nerve. The pigment-spots are branching, often the shape of bone-corpuscles. They appear first and are most numerous in the periphery of the fundus. The night-blindness is commonly noticed in early childhood, and the disease is slowly progressive until at the age of sixty most cases end in complete blindness. Sometimes a very similar condition, but running a more rapid course, occurs in tertiary syphilis. In a few cases, otherwise similar, no pigment-deposits occur.

AMAUROTIC FAMILY IDIOCY is attended with a white opacity of the retina about the macula, with a red spot in its centre, and blindness soon becoming complete, from degeneration of the nerve-cells of the retina.

ANGIOID STREAKS in the retina, brownish streaks of pigment-deposit which have the shape of a vascular network, but which do not conform to either the retinal or choroidal vessels, mark a special form of a retinal degeneration. Vision is impaired, and the streaks are preceded by retinal hæmorrhages.

Diagnosis.—Retinitis must not be confused with blurring of the retinal vessels and other details of the fundus due to errors of refraction, especially regular astigmatism. Blurring from an error of refraction affects all parts of the fundus, or all parts of the retinal vessels running in a certain direction. Retinitis affects only certain portions of the fundus, or some parts more than others, and veils the vessels running in one direction no more than those running in another. The haziness caused by dust-like, localized opacities of the vitreous simulates that of retinitis. Patches of serous retinitis may closely resemble detachment of the retina. The appearance of the retinal vessels upon the surface, with prominence of the swelling and the in-

volvement of a large area, indicates detachment.

Retinitis is generally followed by degenerative changes, and many of the symptoms characterizing its various forms are really degenerative. The diagnosis between the different varieties is indicated in their description. In determining the form of the retinitis other symptoms of the underlying general condition should also be sought for and carefully considered. Thus albuminuric retinitis may be exactly simulated by the retinal symptoms of organic disease of the brain; and only the renal or the cerebral symptoms can establish the diagnosis.

Prognosis.—This depends on the cause of the retinitis. Simple inflammation from eye-strain may end in complete recovery. Purulent retinitis commonly destroys the eyeball, but the form characterized by small, white spots may go on to incomplete recovery. Albuminuric and leukæmic retinitis may improve under treatment, but they partake of the grave prognosis of the underlying diseases. Albuminuric retinitis arising during pregnancy may undergo very marked improvement. Retinitis pigmentosa goes slowly on to hopeless blindness. Other forms of retinitis rarely cause complete blindness; but the vision once lost through them is not regained, or is only partly recovered.

Treatment.—Rest for the eyes and avoidance of bright light and sudden changes of illumination are important, in the active stages of retinal inflammation. Rest must include the use of lenses correcting any ametropia, and may require the use of colored glasses or a cycloplegic. Removal of the cause or appropriate treatment of the underlying dyscrasia comes next in importance. After the acute stage has passed, the

retinal degeneration succeeding it is best met by tonics, and especially strychnine in doses ascending to near the limit of physiological tolerance. Retinitis pigmentosa requires a very moderate use of the eyes and the tonic treatment throughout. Instillations of a weak solution of physostigmine may be employed; and the application of a weak galvanic current, $\frac{1}{4}$ to 1 milliampère, has been credited with benefit.

Embolism and Thrombosis of the Central Retinal Artery.—These cause sudden blindness of one eye, usually permanent.

SYMPTOMS AND DIAGNOSIS.—There is general haziness of the retina, most intense near the posterior pole of the eye, with a dark-red spot at the macula. When one or more branches of the central artery escape obstruction, a corresponding portion of the field of vision is retained. When the macula is supplied by a cilio-retinal artery, full central vision may be preserved. At first the retinal arteries retain their normal appearance, while the veins usually are narrowed or partially collapsed. Later both arteries and veins become greatly shrunken, and the optic disk white and atrophic. The two conditions are to be distinguished from one another chiefly by the presence of some probable source for the embolus in embolism; or preceding symptoms of vascular disease, as brief obscurations of vision, for thrombosis.

PROGNOSIS AND TREATMENT.—In thrombosis the recovery of vision is very improbable. In a few cases of embolism some vision is recovered. Either spontaneously or under treatment the embolus may be broken up and pass onward into some branch of the artery, and even into such peripheral branches that its effects are no longer noticed.

To favor such a termination the inhalation of nitrite of amyl may be pushed to a decided physiological action, and active massage of the eyeball employed. These should be repeated daily for several days before abandoning hope of improvement. If the embolus is dislodged, strychnine may be indicated to promote restoration of the retinal function.

Thrombosis of the central retinal vein causes blindness, less sudden and complete than that due to the obstruction of the artery. It is attended with dilatation of the retinal veins and hæmorrhages throughout the retina, and may be followed by hæmorrhagic glaucoma. The treatment is that of the general condition accompanied by the retinal disease.

Detachment of the retina is a displacement of the retina from its normal position. This may be caused by a tumor or by a displacement of the choroid. But the term is commonly understood to mean a separation of the retina from the choroid by serous fluid.

SYMPTOMS.—There is impairment of vision, usually sudden, and affecting but a portion of the visual field. Commonly the subretinal effusion settles to the lower part of the eye, so that the upper part of the field of vision is lost. The detached portion of the retina may float in front of some part still normal, causing sudden temporary loss of vision. With the ophthalmoscope a gray veil is detected, hiding more or less completely the normal red of the eyeground. It presents rounded folds, which float, as the movements of the eye disturb the fluid beneath. These folds are more hyperopic or less myopic than the undetached parts of the retina that may be seen above them. On the folds may be traced the retinal vessels, appearing very small and dark in color.

DIAGNOSIS.—The rounded gray folds with the retinal vessels on them are unmistakable. It is sometimes more difficult to decide if the case is one of simple detachment or one of detachment due to new growth. Movement of the folds of retina, after moving the eye, indicates that it is floating freely on serous fluid. When attached to a choroidal growth no such movement occurs; and the vessels of the growth, resembling choroidal vessels, may be seen through the retina. When a new growth exists, but the retina is separated from it by serous fluid, the growth may be perceived through the retina by making the ophthalmoscopic examination with direct sunlight. The tension of the eyeball may throw some light on the case, being normal or below in simple detachment and sometimes elevated in cases of tumor. The recognition of detached retina accompanying cataract is important as influencing the prognosis regarding the results of operation. It must depend chiefly upon the careful testing of the field of vision.

ETIOLOGY.—Blows on the eye or head may cause detachment of the retina, either primarily or as the result of other changes in the eye. Very myopic eyes are especially liable to it, and the liability increases with age. Extensive changes in the vitreous, especially cicatricial contraction, may pull the retina away from the choroid. Sometimes a tear may be recognized in the detached retina, apparently due to such traction. Through it the choroid may be clearly seen with the ophthalmoscope.

PROGNOSIS.—A small proportion of cases recover spontaneously. This most frequently occurs in traumatic cases. In a large proportion of cases no treatment will effect the permanent replacement of the retina and restore sight. There is

no hope of cure for eyes having excessive myopia or great alterations of the vitreous.

TREATMENT.—An opening through the sclera permitting the subretinal fluid to escape externally, with or without an opening through the detached portion of the retina to allow it to pass freely into the vitreous, has usually caused a temporary improvement in the detachment; in a very few cases it has afforded permanent relief. But in most cases the detachment has recurred, and there has been no permanent benefit. The burning with the galvanocautery of one or two holes in the sclera that will close only after several days or weeks is claimed to be more efficient. The greatest chance of permanent restoration is given by prolonged rest in bed, with the eyes covered most of the time by a pressure bandage; and the use of pilocarpine-sweats and potassium iodide or salicylic acid internally. But this must be persisted in for several weeks to render the benefit permanent; and in a large proportion of cases it fails to do good.

Glioma of the retina—or, more strictly, *gliosarcoma* of the retina—is a malignant new growth occurring in early childhood.

SYMPTOMS.—Attention is usually first attracted by the appearance of a yellowish reflex in the somewhat dilated pupil, and the eye is found to be blind. On examination the reflex is found to be due to a growth situated back of the lens. It has a silvery or yellow, shining appearance, and small blood-vessels may be seen on it. As it increases the lens and iris are pushed forward, the tension of the eyeball becomes elevated (second, or glaucomatous, stage), and symptoms of irritation and inflammation appear. When the growth perforates the sclera

(third stage) the tension falls, and for a few days the symptoms may seem to abate. Soon, however, the growth causes a noticeable tumor in the orbit, which increases more and more rapidly. Involvement of the brain through the optic nerve or of other organs (fourth stage) quickly occurs, and causes death. Sometimes the growth sets up an iridocyclitis that leads to diminished tension and shrinking of the eyeball (*cryptoglioma*), which, however, ends in the further extension of the tumor. In a large proportion of cases both eyes are affected.

DIAGNOSIS.—The only affection liable to be confused with typical glioma of the retina is chronic purulent accumulation in the vitreous, or *pseudoglioma*. This gives rise to a yellow reflex back of the lens, commonly exhibiting no vessels. Such an accumulation follows purulent retinitis or choroiditis, generally as a sequel to some acute febrile disease, as scarlet fever and cerebro-spinal meningitis. Glioma gives no history of antecedent disease. In pseudoglioma the tension of the eyeball is almost always diminished. In glioma it is normal or elevated. Pseudoglioma remains stationary; glioma is progressive. In cryptoglioma diagnosis may, for a time, be impossible. But, the eye being blind, to treat it as the seat of glioma is proper in any doubtful case.

TREATMENT AND PROGNOSIS.—The treatment for glioma of the retina is removal of the eyeball at the earliest moment, with so much of the optic nerve as can be readily taken with it. If the growth has reached the third stage the removal of the whole contents of the orbit is necessary. Without complete extirpation of the tumor it always causes death. After early removal of the eye about one-third of the cases remain per-

manently free from the disease. But only the lapse of a sufficient period of time, at least three years, can give positive assurance that there will be no recurrence.

Optic neuritis, papillitis, or choked disk is an inflammation of the ocular end of the optic nerve. It is important as a symptom of the diseases which cause it, and on account of the atrophy and impairment of vision which are liable to follow it.

SYMPTOMS.—The essential symptoms, hyperæmia and swelling, are only discoverable by the ophthalmoscope. Hyperæmia at first causes the optic disk to appear redder, and more uniform in color than normal. At the same time exudation causes blurring or complete obscuration of its outlines; so that the location of the disk may only be recognized by the convergence to it of the larger retinal vessels. As the inflammation advances, the swelling becomes greater; and measurement of their refraction with the ophthalmoscope shows that the vessels at the centre of the disk are pushed forward into the vitreous. With the increased swelling the small vessels become separated by exudate, and the general color of the disk becomes more gray. The individual vessels, greatly enlarged and tortuous, appear and disappear in the swelling. The principal branches of the retinal arteries are small from compression at the point of entrance to the eye; and from compression at the point of exit the veins are swelled, dark, and tortuous. Hæmorrhages occur mostly on or near the disk. Vision may not be noticeably impaired. It may remain practically normal, even with great swelling. When impairment of vision does occur, it is rather a sign of optic atrophy secondary to the neuritis, or of involvement of the

visual centres or optic tract within the cranium. The course of the disease is essentially chronic, sometimes lasting for many months, or even several years, when caused by a slowly-growing tumor. Ultimately, if the patient lives long enough, the swelling becomes paler and diminishes, and the process passes over into one of optic atrophy. Commonly both eyes are affected, although often one earlier or more severely than the other.

Monocular neuritis may occur from cold, rheumatism, or local causes.

The diagnosis rests on the ophthalmoscopical appearances above described. In a severe case these cannot be mistaken. But a commencing neuritis may easily be confused with the hyperæmia and slight haziness of the disk, often seen with eye-strain, and in rare cases protrusion and haziness exist as a congenital anomaly. In these doubtful cases repeated observations must be made. At this stage neuritis is progressive, the swelling and the alterations of the vessels increasing, while conditions with which it might be confused remain unchanged for a long period. Subsiding neuritis, which might also be overlooked, is likely to be attended with impairment of vision, especially with irregular contraction of the field of vision; and with opacity of the nerve-head hiding its deeper details, pigment-disturbances about the disk, and opacity of the walls of the retinal vessels or irregularities in their calibre.

ETIOLOGY AND PATHOLOGY.—A mild form of optic neuritis may arise from eye-strain. Syphilis, rheumatism, lead poisoning, Bright's disease, and extension of inflammation from adjoining structures may cause it. But the larger number of cases are due to organic disease of the brain and its membranes, especially tumor, meningitis, and ab-

scence. Its connection with intracranial disease has been the subject for much speculation. The principal theories to account for it are: 1. That the inflammation reaches the nerve-head by direct extension from within the cranium, either through the nerve-trunk or along its sheath. 2. That the inflammation is due to "choking of the disk" by intracranial pressure, transmitted by the veins or the lymph-spaces around the nerve to its point of entrance into the eyeball, where the sheath of the nerve is usually found dilated. 3. That the inflammation of the nerve-head arises through a nerve-influence controlling its nutrition and originating in afferent nerves distributed to the cerebral meninges. 4. That toxic substances make their way along the lymph-spaces surrounding the optic nerve from the cranial cavity to the nerve-head, where they excite inflammation. Neither of these theories seems consistent with all the facts, and it is probable that various influences contribute to the result. Relief of intracranial pressure is often followed by improvement in the neuritis, and Deyl suggests that the pressure may act by "choking" the central retinal artery and vein where they enter the optic nerve back of the eye.

PROGNOSIS.—If the cause of the optic neuritis is one that can be removed, partial or complete recovery is likely to follow. Otherwise the neuritis passes into the optic atrophy, and blindness results.

TREATMENT.—Besides the efficient treatment of its cause and especially the treatment for syphilis in all doubtful cases, the standard treatment for optic neuritis of intracranial origin is by potassium iodide in doses rapidly increased up to the limit of tolerance. Tapping the sheath of the optic nerve

has been tried with the idea of relieving pressure, but it is of doubtful benefit.

Retrobulbar optic neuritis is marked by pain in the orbit and soreness or tenderness on moving the eye or pressing it backward. Vision is impaired in some part of the field of the affected eye. At first the disk may appear normal, or slightly swelled and hazy. Later it may show signs of atrophy. Recovery usually occurs, and vision may be completely restored. The causes are cold, rheumatism, syphilis, acute fevers, and alcoholic or other poisoning. (See TOXIC AMBLYOPIA.) It may attend degenerative disease of the brain and spinal cord. It is to be treated through its cause, and by local blood-letting, potassium iodide, and later strychnine.

Optic Atrophy.—Atrophy of the optic nerve consists essentially in atrophy of some or all of its nerve-fibres. It is always attended with impairment of vision, and is a common cause of permanent blindness. It is also important as a sign of disease in the central nervous system.

SYMPTOMS.—The impairment of vision generally affects central vision, and always includes some limitation of the visual field. It is at first progressive. The fields for colors are usually contracted earlier and to a greater extent than the field for form; and they may be obliterated, producing acquired color-blindness. When the blindness is complete, especially if it has come on rapidly, the pupils may be widely dilated. More commonly the pupils are not greatly enlarged. With the ophthalmoscope the optic disk is found less vascular than normal. It may be a dead white, or gray, bluish, or greenish hue. It presents few small vessels. The large branches of the retinal vessels may be of normal size, or they may be greatly contracted.

CAUSES AND VARIETIES.—Atrophy, not due to preceding disease of the optic nerve or retina or to injury or to pressure on the nerve or chiasm, is called *primary atrophy*. It may be congenital or hereditary or may follow acute disease or syphilis. It sometimes accompanies or precedes spinal sclerosis, or is caused by poisoning by lead, alcohol, etc. Atrophy following injury to, or pressure upon, the optic nerve is called *secondary*. *Consecutive atrophy* is atrophy following optic neuritis or neuroretinitis, or disease of the retina or choroid, as embolism of the central retinal artery or syphilitic chorioretinitis. Its causes are those of the conditions it follows.

DIAGNOSIS.—The ophthalmoscopic picture of advanced atrophy is usually quite striking. But commencing atrophy cannot be certainly recognized with the ophthalmoscope; and even the appearance of pronounced atrophy may be simulated in disease, like quinine blindness or ischæmia of the retina from severe hæmorrhage, which admits of partial or complete recovery. The diagnosis is most safely based on narrowing of the field of vision, particularly for colors, with ophthalmoscopic appearances that point toward atrophy.

In primary atrophy the disk is usually gray and its details, with the lamina cribrosa, very distinct. The retinal vessels are not greatly narrowed. The field of vision is contracted regularly. In secondary atrophy the disk is more likely to be white. The retinal vessels may or may not be contracted. In consecutive atrophy the nerve-head is usually opaque, the neighboring choroid disturbed, and the retinal vessels somewhat contracted and often irregular in calibre. The visual field is irregularly contracted. After chorioretinal disease the disk shows

dirty-yellowish color, and the lamina is hidden.

TREATMENT AND PROGNOSIS.—The most effective measures are those directed to the causes of the atrophy, and they must be as varied as those causes. In addition, mercury and potassium iodide may be tried in the early stages, even in cases not of syphilitic origin. Later strychnine should be tried in doses rising gradually to the physiological limit. This is sometimes as high as $\frac{1}{5}$ grain, three times daily by the mouth, or once daily hypodermically. General measures, including change of occupation and climate, may be beneficial. Inhalations of nitrite of amyl and applications of galvanic electricity have been tried with reported benefit in some cases. Primary atrophy generally goes on to blindness. The prognosis for secondary and consecutive atrophies depends on early treatment and the possibility of controlling the cause.

Tumors of the optic nerve cause protrusion of the eye and loss of sight. They begin in childhood and develop slowly, without pain or much interference with the movements of the eyeball. They are usually myxomas or fibromas which do not recur after removal.

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ORBIT, DISEASES OF.

Congenital Malformations.

ANOPHTHALMOS, or congenital absence of the eyeball, is a rare condition; and in most cases there is found on dissection a small button of tissue representing the globe, which is often attached to a thin-walled cyst that distends the lower lid. The lids and orbits are commonly smaller than normal.

MENINGOCELE—a protrusion of the brain-meninges into the orbit through a

lack of development of the wall of the latter—is distinguished from other tumors of the part by presenting an elastic rounded swelling, which pulsates with the heart, and can be reduced by steady pressure until the defect in the orbital walls is revealed.

MICROPTHALMOS, or congenital smallness of the eye, varies from cases that present only high hyperopia to those approaching anophthalmos. In the higher degrees the eyes are always quite defective. Both eyes are commonly affected.

ENOPHTHALMOS, or sinking of the eyeball within the orbit, is noticed after exhausting disease, in paralysis of the sympathetic nerve; neurotic facial atrophy, occurring periodically with neuralgia of the fifth nerve; and after traumatism. In the latter case it may be due to fracture of the walls of the orbit or to the influence of cicatricial bands.

EXOPHTHALMOS, or undue protrusion of the eyeball, may arise from many conditions. It is the most striking symptom of exophthalmic goitre (see volume iii), may be produced by emphysema of the orbit, after fracture of the bones including the air-passages. It is also caused by hæmorrhage into the orbit or inflammation, disease of the orbital walls, new growths, or by paralysis of the ocular muscles, especially those supplied by the oculomotor nerve. Temporary exophthalmos may be produced by stooping, and holding the head low, especially in women near the menopause.

PULSATING EXOPHTHALMOS, attended with a distinct bruit heard over the temple and neighboring parts and audible to the patient, is most frequently caused by a rupture of the carotid artery into the cavernous sinus. This may occur spontaneously or from crushing injuries to the head. Pulsating exoph-

thalmos has sometimes ended in spontaneous recovery. In other cases no lesion was revealed by post-mortem dissection. In a few cases it has been due to aneurism of the ophthalmic artery.

Treatment.—Pressure on the carotids, either intermittent, which may be made by the patient himself, or continuous, should be tried. When pressure fails, ligation of one, and often the second, carotid should be resorted to.

Case of traumatic pulsating exophthalmos, most probably caused by orbital aneurism, successfully treated by employing compression of the corresponding external carotid and medication. Hirschberg (*Deut. med. Woch.*, No. 15, '89).

Plea made for early ligation in cases of pulsating exophthalmos. Walker (*Lancet*, Jan. 27, '94).

Orbital Cellulitis.

General inflammation of the extra-ocular contents of the orbit arises from traumatism, cold, erysipelas, other specific fevers, metastasis in septicæmia, thrombosis of the cavernous sinus, or extension of inflammation from the eyeball, or from the walls of the orbit, or the neighboring cavities.

Symptoms.—There is pain in the orbit, and often severe general headache, lessened mobility of the eyeball, protrusion of the eye, and swelling of the orbital tissues and lids. The vision is impaired and diplopia may be noticed. The invasion may be marked by a severe chill, and considerable fever may attend the disease. The eyeball is liable to become involved in the inflammation; and, even if this does not occur, optic neuritis and atrophy are apt to result. There is serious danger of extension to the meninges of the brain, causing death. In a few cases the symptoms are mild and spontaneous recovery occurs in a few days.

Literature of '96-'97-'98.

Case of acute necrotic cellulitis of both orbits, with absence of any discoverable cause. There first formed an abscess behind the globe, from which an ounce of pus containing fragments of necrotic tissue was evacuated. Soon the entire contents of the orbit became involved in the necrotic process. Subsequently the other orbit became involved, and eventually the patient succumbed from pyæmia. W. T. H. Spicer and H. Wilbe (*Lancet*, Nov. 5, '98).

Treatment.—On the appearance of the earliest symptoms free local bleeding by leeching, or the artificial leech, should be resorted to, and calomel given and followed by a saline purgative. Hot fomentations should be applied, and frequently renewed to keep them as hot as can be borne. Any localized accumulation of pus should be promptly and freely evacuated. Even when no pus has accumulated, it is well to make incisions with a straight bistoury, from the retrotarsal folds of the conjunctiva, parallel with the orbital walls and as near them as possible, to the depth of an inch or more. These incisions may be washed out with warm, antiseptic solutions and packed with antiseptic gauze. When swelling of the lids prevents the making of such incisions from the conjunctival sac, they may be made through the lids, near the orbital margin. In any case they should be so placed as to avoid injury to the ocular muscles if possible. If the eyeball has been the starting-point of the orbital inflammation, and is so damaged as to preclude vision, it should be promptly enucleated. The general treatment should often include tincture of iron, quinine, and good feeding, and sometimes alcoholic stimulants.

For cellulitis, the skin of the orbit should be repeatedly painted with a 5-

per-cent. solution of silver nitrate, and a boric-acid dressing and roller pressure-bandage applied. Godfrey (Med. Rec., Nov. 3, '94).

TENONITIS, or inflammation of the oculo-orbital fascia, presents many of the symptoms of orbital cellulitis, but in less severe form. The immobility of the eye and pain on movement are relatively great, but the swelling is less general and severe. It arises from traumatism, as from a squint operation, or is often of a rheumatic or gouty character.

Treatment includes hot applications, and free exit for any pus that may be formed. Sometimes local bleeding is important. The rheumatic and gouty cases yield to salicylates or iodides; pain may require the use of anodynes.

Orbital Tumors.

These cause displacement of the eyeball, dependent on the location and the size of the tumor. Sometimes there is limitation of the movements of the eyeball or double vision. But with slowly growing tumors there may be great displacement of the eyeball, without diplopia or destruction of vision. Pain usually appears late in the progress of the growth.

Varieties.—**TUMORS OF THE OPTIC NERVE** cause early blindness and optic atrophy; the displacement is usually directly forward or a little outward, and ocular movements remain good. They are apt to have the character of a fibroma or myxoma, showing little or no tendency to recur.

DERMOID CYST.—This variety of growth appears as a rounded, slowly growing tumor, which is seen most frequently at the upper inner angle of the orbit; but it may be situated at the outer angle or the upper or lower margin.

CYSTICERCUS and ECHINOCOCCIC CYSTS

also occur in the orbit, but are extremely rare in this country.

Literature of '96-'97-'98-'99.

In a search through literature only 59 cases of echinococcus of the orbit found since 1774. In Fuchs's clinic in Vienna out of 142,425 cases of diseases of the eye but 2 cases have occurred during eight years. Albert Blaschek (Wiener klin. Woch., Feb. 9, '99).

ANGIOMATA, both simple and cavernous, occur in the orbit. They are compressible and commonly involve the lids. They increase in size with crying, or on holding the head down. They rarely exhibit pulsation; and the pulsation is never so marked as in meningocele or pulsating exophthalmos.

SARCOMATA.—These are the important malignant tumors of the orbit. They may be so vascular as to pulsate and be compressible; or they may be hard and fibrous, growing very slowly, and causing great displacement of the eyeball, without entire destruction of vision.

CARCINOMA of the orbit is always secondary to similar disease of the lacrymal gland, lids, conjunctiva, eyeball, or adjoining cavities or more distant organs.

Literature of '96-'97-'98.

Case of tumor of the orbit, thought possibly to be syphilitic, treated with heroic doses of potassium iodide and mercury, without avail. Growth was removed piecemeal, leaving an apparently sound eye. Panophthalmitis set in and the patient was discharged six weeks after the operation, with a sunken and sightless eyeball. Tumor removed was believed to be a sarcoma, but patient died about a year later from carcinoma of the throat. David Webster (Med. News, Aug. 27, '98).

Treatment.—Non-malignant tumors should be excised. In rare cases a dermoid cyst may extend so deeply that its

complete removal by dissection would be extremely difficult or impossible. In such a case we should cleanse the remaining portion of the sac, and place in it tincture of iodine or crystals of silver nitrate to secure its obliteration. Where possible, benign tumors, even those of the optic nerve, should be removed without sacrificing the eyeball.

For malignant tumors the only hope for cure is by complete removal. In rare cases, where the eye retains useful sight, removal of the evident new growth must

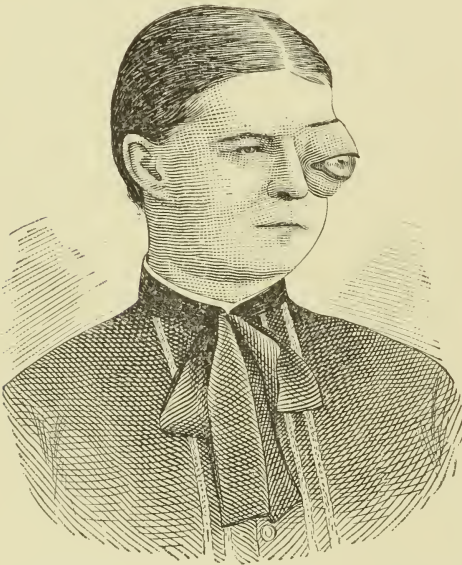


Fig. 1.—Tumor of the orbit. (Vance.)

be depended on. But the prospect of future immunity is decidedly improved by the removal of the whole contents of the orbit. Sarcomas of the spindle-cell variety may not return. Other varieties are more likely to recur, and it is doubtful if removal often prolongs life. It is, however, fully justified for the purpose of relieving pain and rendering the patient's condition temporarily more bearable.

Tumor of the orbit that occurred in a girl, 19 years old, first made its appear-

ance nine years before, causing pain in the eye, which was soon followed by exophthalmos. It is shown in Fig. 1. Fig. 2 shows the appearance of the growth after its removal. At this time it was adherent to the bony framework of the orbit. It was readily extirpated. Vance (*Jour. Arkansas Med. Soc.*, May 15, '93).

Recurrence of malignant growths may be prevented by the employment of large grafts of skin upon the denuded area left after the extirpation of the neoplasm. Health of the patient should be built up before the grafting. The grafts should always be one-fifth to one-third larger than the site of the wound, and only the true skin, free from fatty subcutaneous tissue, should be taken. A pedicle is of no advantage. Tiffany (*Oph. Rec.*, Apr., '94).

Literature of '96-'97-'98.

Following conclusions are based upon histories of 36 cases of orbital tumors, all taken from personal private practice. All these cases have been watched from start to finish. In a much larger experience, extending over a period of twenty-five years of hospital service, the same conclusions have been reached:—

1. The prognosis of all forms of malignant orbital tumors, whether primary or secondary, is unfavorable; and, if the tumor is primarily in one or more of the deep facial bones or their sinuses, the prognosis is positively bad.

2. Except in the case of capsulated tumors of the orbit, surgical interference is almost invariably followed by a return of the tumor; and the growth of the secondary tumor is more rapid than that of the primary lesion. With each succeeding operation the period of quiescence in the return of the tumor grows shorter and the rapidity of the growth increases.

3. The patient's family, and in certain cases the patient himself, should, in the beginning, be told of the serious nature of the trouble, and be warned that complete removal of all disease-germs is a well-nigh hopeless task. The burden of the decision as to surgical interference

must rest upon the shoulders of the patient.

4. Repeated operations in these cases undoubtedly shorten the life of the patient. While it is, therefore, our duty to operate in all cases in order to relieve severe or unbearable pain, we should be slow to operate merely for the sake of relieving temporarily physical disfigurement or deformity, especially if we are convinced that by so doing we shorten the life of the patient, even if that

walls and neighboring cavities include a large proportion of the cases of orbital disease. The majority of malignant tumors grow into the orbit from adjoining cavities. Mucocoele and empyema of the frontal, ethmoidal, or maxillary sinus makes its way into the orbit, sometimes through an opening caused by absorption of the bony wall, sometimes pushing a bony shell before it. The

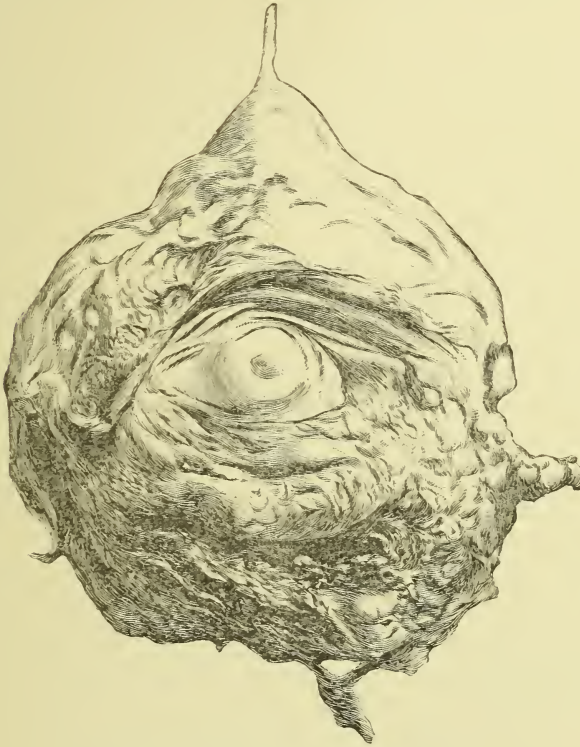


Fig. 2.—Tumor of the orbit. (Vance.)

shortened life is rendered more bearable to him. C. S. Bull (N. Y. Med. Jour., Aug. 29, '96).

In cases of dermoid cysts of the orbit, iodine on cotton used to swab out the sac; it should then be packed with cotton, which is removed on following day without anything further. Myles Standish (Trans. Amer. Ophthalm. Soc., p. 687, '96).

Miscellaneous Orbital Diseases.

Diseases originating in the orbital

most important treatment is that directed against the original disease. This, with free drainage, will generally secure the healing of the lesions in the orbit.

PERIOSTITIS AND CARIES OF THE ORBITAL WALLS cause orbital swellings, inflammation, abscess, and discharging sinuses. They must be treated as such lesions elsewhere, with especial care to keep up free drainage, and not to at-

tempt the removal of dead bone, except after very careful study of the case, and through a free opening.

OSTEOMA OF THE ORBIT, or ivory exostosis, is a very hard, bony tumor, invading the orbit from the frontal or ethmoidal sinus, and sometimes also invading the cranial cavity. It appears at the upper inner angle, or the upper margin of the orbit, and grows very slowly, displacing the eyeball downward and usually outward, and for a long time continues painless. It should be removed as early as possible to forestall the danger of extension inward. There is little tendency to recurrence.

Literature of '96-'97-'98.

Case of ivory exostosis of the orbit in a man, aged 24 years, who had noticed the tumor for six years, and attributed it to a blow received four years before that. Symptoms for which removal was sought were occasional severe headaches and dizziness. The movements of the eye were limited outward and upward, causing diplopia in the corresponding portion of the field. On its removal the base of the tumor was found to involve most of the orbital plate of the ethmoid and a portion of the lacrymal bone. Dizziness and double vision were entirely relieved, and patient remained well fourteen months after operation. W. F. Norris (Trans. Amer. Ophthal. Soc., p. 67, '97).

EDWARD JACKSON,
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ORTHOFORM.—Orthoform is the methyl-ester of meta-amido-para-oxybenzoic acid. It occurs as a white, or light, dirty-yellow, odorless powder, slightly soluble in water, and easily dissolved in glycerin or in water acidulated with hydrochloric, nitric, or acetic acid. It is feebly antiseptic, and has no poisonous properties. When applied to mucous or abraded surfaces, it exerts an

anæsthetic and analgesic action, which generally lasts at least twenty-four hours.

Preparations and Doses.—E. S. Yonge (Brit. Med. Jour., Feb. 5, '98) gives the following as being the most suitable preparations:—

1. The crude powder, either alone or mixed with equal parts of lycopodium, which should be accurately insufflated upon the required area, since orthoform takes effect only on contact and does not extend beyond.

2. Pastilles: Orthoform, 3 to 5 grains; solution of cochineal, q. s.; saccharin, $\frac{1}{4}$ grain; glyco-gelatin, q. s. These pastilles are useful in oral, tonsillar, and post-pharyngeal affections, but less so than the two preceding preparations.

3. Orthoform-collodion: A saturated solution of orthoform in collodion, forming a species of "varnish." This is useful in ulcers exposed to much friction; but, as it causes acute smarting, it is advisable to anæsthetize the ulcer first, either with cocaine or with orthoform in powder.

4. Spray: Orthoform, 5 grains; alcohol, 50 minims; water, 50 minims. This is used in spray and is, perhaps, the best form for treating nasal and laryngeal ulcerations. The alcohol evaporates quickly after contact with the parts, leaving the precipitated powder evenly distributed over the affected area.

5. Ointment (10 per cent.).

6. Aqueous solution (10 per cent.) of the hydrochloride as a paint.

Physiological Action.—Orthoform is said by Kallenberger to be absolutely free from any toxic property, and consequently may be used with perfect freedom. When it comes in contact with sensory nerve-filaments it has a powerful anæsthetic effect, which persists in some instances for three or four days;

on account of this property it is an excellent dressing for burns or painful ulcers. Another important property is its inhibiting effect upon secretion, and in case of carcinomatous ulcers or of transplantation-wounds the dressings remain so dry that they seldom require renewal.

Recent experiments by Soulier and Guimard, however, showed that in the dog a dose, by mouth, of orthoform which exceeds fifteen grains per 2 pounds of body-weight is to be considered toxic. But warm, 1-per-cent. solutions of orthoform, injected into the peritoneal cavity, produce toxic effects in the dose of $3\frac{3}{4}$ grains per 2 pounds of weight. The substance may, indeed, cause death in six minutes if it reach the dose of $7\frac{1}{2}$ grains per 2 pounds.

The action of orthoform, after injection, is that of a powerful cerebro-spinal nerve-depressant. Its local action, on the other hand, requires direct contact with the nerve-endings. Soulier and Guimard consider that orthoform is an *analgesic*, in the true sense of the word, rather than an anæsthetic.

Literature of '96-'97-'98-'99.

Orthoform sometimes produces a decided irritating effect on the skin. When used in solution it excites hyperæmia, and sometimes severe pruritus. When used in the form of an ointment it not infrequently caused, in the course of one or two days, a pruritic eruption.

In one patient application of an ointment (1 to 40) to the face induced great swelling and marked redness, lasting nearly three weeks. In another patient use of the powder on a fissure of the vulva caused intense tumefaction, and nodular swellings in various parts of the body. Brocq (*La Presse Méd.*, Apr., '99).

Peculiar necrotic process noted appearing in the course of three to fourteen days after the application of orthoform to tumors, ulcerations, wounds, etc., and retrogressing when the orthoform was stopped. The first inflammatory stage

of the process produced metastases in six cases, by reflex action or by the circulation, terminating in the necrotic stage. In the nine cases reported orthoform at first produced its usual favorable effect. In numerous other cases in which it was used both internally and externally there were no unpleasant results from its use. W. Asam (*Münch. med. Woch.*, Feb. 21, '99).

Therapeutics. — Orthoform is chiefly used in painful ulcerations of the upper air-passages. It occasionally produces a slight burning for a few minutes after its application. It may replace cocaine when prolonged anæsthesia of ulcerated surfaces is desired, cocaine being reserved to produce temporary anæsthesia of an intact mucous membrane.

Orthoform has been extensively employed by Neumeyer (1) in painful disorders occurring in the upper air-passages, as in tuberculous ulceration of the larynx; (2) in operations as a local anæsthetic; (3) in pain due to gastric ulceration, whether simple or malignant; (4) in urethral pain; (5) in painful disorders of the skin; and (6) in neuralgias, in tabes, etc. He also observed that orthoform exercises an excellent local, anæsthetic action. One application often sufficed to lull pain for hours or even days. The remedy must be applied directly to the nerve-endings. In painful angina of the throat the application of orthoform was without effect, as it does not act on an intact mucous membrane. In neuralgias it was without action.

Literature of '96-'97-'98-'99.

Orthoform has given good results in hay fever, the powder being insufflated into the nasal cavities. Lichtwitz (*Archives Inter. de Laryng.*, Jan., Feb., '98).

Orthoform used in a large number of cases of rhino-laryngology, and complete local anæsthesia has always been obtained when applied to exposed sensitive terminal nerve-endings. In all forms

and varieties of ulcerations in the nose, mouth, pharynx, or larynx it gives absolute freedom from pain, the effect lasting several hours to several days. It is so thoroughly antiseptic that ulcerations heal much more rapidly when orthoform is used than when it is not used. In troubles of the fauces where there is no ulceration, but where the epithelial layer of mucous membrane has been denuded, the application of orthoform relieves the pain and reduces the inflammation. After removal of the faucial tonsils, if orthoform is applied to the cut surfaces the patients can eat solid food without pain, and the parts heal quickly. There is no pain after removal of an elongated uvula if orthoform is applied.

In case in which a necrosed tooth was removed the soft parts were badly lacerated. The cavity was packed with orthoform and in a short time all pain was relieved and the patient could eat with no inconvenience. The relief of the pain lasted eight hours, when the cavity was again packed with orthoform. Twenty-four hours after the operation the case was examined and no pain, soreness, or inflammation was found; the lacerated parts were pale and shrunken, and did not become inflamed in the least. John North (*Amer. Med. Compend*, Nov., '98).

Emulsion of orthoform, 25 parts, and olive-oil, 100 parts, used for laryngeal application. The burning sensation lasts only about a quarter of an hour, and is then succeeded by anæsthesia, which commonly lasts from 24 hours to 3½ days. The patient is able to eat all kinds of food, the appetite is greatly increased, and it seldom causes dyspepsia. The emulsion has been employed chiefly in cases of tuberculosis. A distinct diminution in the amount of secretion in cases of ulceration is noted, but otherwise it does not appear to have any local therapeutic value. Patients do not dread the lactic-acid treatment if orthoform emulsion is used regularly. Kassel (*Ther. Monats.*, No. 10, '98).

Orthoform may be employed in various combinations, at first as a powder without any addition; but the following emulsion with the yolk of an egg is particularly recommended:

R. Menthol, 2½ drachms.

Ol. amygdal. dule., 7½ drachms.

Vitelli ovi (about two yolks), 7½ drachms.

Orthoform, 3 drachms.

Aq. dest., q. s. ad 3 ounces.

M. Ft. emulsio.

The best results have been obtained with it, an ordinary laryngeal syringe being employed. In about five minutes the patient experiences a feeling of euphoria. The yolk of egg does not decompose, but remains permanent for a number of weeks. W. Freudenthal (*Phila. Med. Jour.*, Mar. 25, '99).

Orthoform is used as an application to burns and painful sores, applied in powder or ointment.

Literature of '96-'97-'98-'99.

Orthoform induces anæsthesia of only those parts with which it comes in contact, and has no effect when applied to the unbroken skin. In a burn of the third degree the anæsthetic effect is remarkable. It also allays the pain of ulcers, both cancerous and other kinds. In one case as much as 750 grains were sprinkled on a wound within a week. It is strongly disinfectant, hindering decomposition and fermentation. Einhorn and Heinz (*Münch. med. Woch.*, Aug. 24, '97).

Observations made at the Munich Surgical Clinic on wounds of various kinds, on burns of second and third degrees, on ulcers (luetic, varicose, carcinomatous, etc.), on dental caries, etc., summarized as follows: 1. Loss of sensation commences, on the average, in from three to five minutes after application, whether as a powder or as 10- or 20-per-cent. ointment. 2. The anæsthetic action continues, on the average, for about thirty hours, in many cases even for three or four days. Only in one case did the action last scarcely two hours, the powder being carried away by copious secretion. 3. Diminution of secretion is always observed: a feature which is very valuable, for instance, in transplantations, where the grafting of the transplanted skin is promoted. The reduction of very copious and troublesome

salivation in a case of inoperable cancer of the cheek was also noted. 4. Non-poisonousness is demonstrated by the fact that in a case of carcinoma 2 ounces weekly were applied without any bad effect. W. Cheatham (*Amer. Pract. and News*, Aug. 15, '98).

Forty cases of cracked nipples at the Charité Hospital were dressed with orthoform, which brought about complete anaesthesia during suckling and kept the cracks aseptic. The infant was put to the breast a quarter of an hour afterward, and sucked eagerly, as orthoform has neither taste nor smell. The anaesthesia persists for some time. Strong alcoholic solution of orthoform dropped into the cracks is better than the orthoform powder alone. Maygrier and R. Blondel (*Lancet*, Nov. 19, '98).

Orthoform is the sovereign agent for the pains occurring after the extraction of teeth with peridontitis. It may be applied on a moist piece of cotton, when it quiets at once the severest pain. Jessen (*Deut. Zaltaerztl. Woch.*, No. 10, '98).

Every operation about the rectum, about the urethra, and sexual organs is followed by the most intolerable pain, smarting, burning, or itching. All of these cases are relieved by the use of orthoform as a powder in the first dressing, its action lasting about twelve to twenty-four hours. Orthoform after operations for the removal of hæmorrhoids has been used with the most satisfactory results.

In burns of the hand most excellent results are obtained. If the blebs are large, they may be carefully dissected away with the scissors, and then dusted with orthoform powder. This is covered with plain gauze and surrounded with a liberal dressing of absorbent cotton. Bayard Holmes (*Woman's Med. Jour.*, Jan., '99).

LOCAL ANÆSTHESIA.—Hirschbruck, to obtain local anaesthesia, injects a 2-per-cent. solution of cocaine ($\frac{1}{30}$ grain of the salt) and then injects 15 minims of distilled water containing 3 per cent. of orthoform ($\frac{1}{2}$ grain) in suspension, the syringe being constantly shaken

when administering the latter. This process appears to be quite free from danger. Anaesthesia is induced in from five to ten minutes.

By mixing 5 to 10 per cent. of orthoform with a 10-per-cent. solution of salicylate of mercury, the pain accompanying intramuscular injections for syphilis is prevented or relieved. There is some local pain with nausea eight to ten hours afterward, but these troubles are never intense and last only a short time. No unpleasant effects were ever observed. Loeb (*Monats. f. prak. Derm.*, B. 27, No. 1).

Literature of '96-'97-'98-'99.

Employment of orthoform combined with Schleich's method in following manner: An injection is first made after Schleich's method, which permits the painless incision of the tissues. The anaesthesia is then completed and rendered more profound and durable by powdering the wound with orthoform. This method has given very satisfactory results. Isidor Dreyfus (*Münch. med. Woch.*, p. 527, '98).

As orthoform and new orthoform cannot be used hypodermically on account of the difficulty with which they dissolve, and as their salts are too irritant for that purpose, there has been personally produced, by substitution, a substance sold under the name of nirvanin, which is not alone more permanent than cocaine, but also ten times less toxic; it is also antiseptic. In 2-per-cent. solutions, injected hypodermically, it produces a prolonged regional anaesthesia. Einhorn and Heinz (*Münch. med. Woch.*, Dec. 6, '98).

In ninety-four operations performed under the effect of nirvanin. No unpleasant symptoms appeared in any of the cases. The best method of employing the drug is to make a 2-per-cent. solution with sterilized saline fluid. Teuchenburger (*Münch. med. Woch.*, Dec. 6, '98).

Practically painless injections of calomel may be made by means of the simultaneous use of orthoform. The mixture was employed in a case of syphi-

littic glossitis, and, not only was analgesia obtained at the time of the injections, but on the fourth day, when there is usually a painful reaction, only slight local discomfort was evidenced. Danlos (Med. News, Mar. 4, '99).

Orthoform may be taken internally in doses of 8 to 15 grains, as an internal anodyne.

Literature of '96-'97-'98-'99.

Observations made in Leyden's clinic show that, besides its anæsthetic effect on raw surfaces, orthoform is absorbed by the intestinal canal, and is eliminated somewhat changed in chemical composition by the kidneys. It may be given in doses of from 15 to 20 grains per day, and it is said to relieve pain in cystitis and gonorrhœa. The urine does not readily undergo putrefaction during its administration. Editorial (Deut. med. Woch., June 30, '98).

In affections of the stomach about 3 knifepointfuls of orthoform should be given in a glass of water. This is to be taken at a draught and the patient should then lie in various positions successively, to insure contact of the mixture with the gastric wall at all points, unless any particular portion of the wall is the seat of pain, in which case the patient should lie in such a position as to bring about the prolonged application of the drug to the affected area. In ulcer of the stomach and in carcinoma (at the stage of ulceration) the analgesic effect was well marked. It is best administered on an empty stomach, and is especially efficacious after the organ has been washed out. Kindler (Fortschritte der Med., No. 7, '99).

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ORTHOPÆDIC SURGERY.

Definition.—Orthopædics is that branch of surgery which relates to the prevention and correction of deformities. Although it is difficult to draw a sharp line between cases that enter into the field of orthopædic surgery and those

that do not, it is generally conceded that true orthopædic cases are those which require some mechanical appliances in their treatment.

Club-foot.

General Considerations and Varieties.

—Club-foot is the name applied to a condition of the foot in which it is more or less deformed and displaced from its normal position. The displacement of the foot is in the direction of a normal movement; thus, it may be inward, when it is called *pes varus*; outward, when it is called *pes valgus*; flexed anteriorly, constituting *pes calcaneus*; and extended, causing walking on the toes, when it is called *pes equinus*. The distortion may be a compound instead of a simple one, producing an *equino-varus* or *equino-valgus*. Usually the affection is congenital, but not rarely it is acquired; in such cases paralysis plays an important part.

The most common form is *equino-varus*, in which the foot is raised at the heel and the sole turned inward. Ordinarily the diagnosis is easy, but a wrong course is not infrequently pursued, hardly on account of the difficulty in recognizing the condition, but rather because the parents and even occasionally the physician do not appreciate the necessity of instituting treatment at once. In congenital cases treatment can be carried on with advantage almost from the moment of birth, yet it is not seldom that the importance of undertaking treatment is only appreciated when the child attempts to walk, eight months to a year and even later. The difference between the acquired and congenital forms should be carefully established, as it influences both prognosis and treatment. In the congenital form, for instance, the muscles of the lengthened tendons are not paralyzed, but

merely disabled by their abnormal position. When, therefore, the faulty position is corrected, the muscles will resume their functions, and the prognosis

as regards an ultimate good result, and even complete cure, is excellent.



Equinus.



Calcaneus.



Varus.

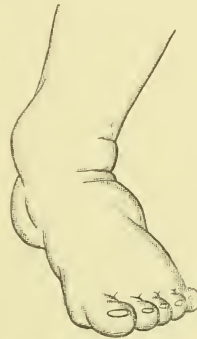


Valgus.

Varieties of simple club-foot. (*McCurdy.*)



Equino-varus.



Equino-valgus.



Calcaneo-varus.



Calcaneo-valgus.

Varieties of compound club-foot. (*McCurdy.*)

Again, in the acquired form paralysis of one set of muscles is usually more or less complete, and as this is often permanent it is obvious that in many cases a cure cannot be expected, and the best that can be done is to improve the function and appearance of the part. Operative measures are to be undertaken only with the greatest care. It is evident that if tenotomy is performed on the contracted muscles the limb is left helpless, as both sets of muscles are disabled.

All club-feet can be straightened without surgical aid up to the age of thirty years. Tenotomy of the tendo Achillis should only be attempted after the foot has been brought into the abduction position. F. Schultze (*Zeit. f. Ortho. Chir.*, vol. iii, Nos. 3, 4, '95).

Literature of '96-'97-'98-'99.

Nearly all of the acquired club-feet are due to infantile spinal paralysis. The foot-deformity results from the prolonged malposition and growth in that position. There are a certain number of distorted feet due to infantile cerebral paralysis.

In hysterical club-foot the deformity is usually an equinus or equino-varus, and resembles in many respects the deformity due to cerebral paralysis. John Ridlon (*Phys. and Surg.*, Feb., '96).

Remarks on the treatment of club-foot, based on personal experience of 300 cases. Possibility and results of treatment are:—

1. The prognosis in ordinary non-paralytic club-foot is good.

2. In children the restoration of form should be perfect, and function should closely approximate the normal.

3. Restrictive methods, either by dressings or apparatus, should be as little employed as possible.

4. Persistent manipulation improves function and development.

5. Operative treatment must be thorough. No part of the correction of deformity should be left, hoping that mechanical means will complete the work.

6. Intelligent and long-continued after-treatment is essential to a final good re-

sult. Properly-constructed boots should be worn, and the foot retained in the corrected position at night.

7. Age is no bar to successful treatment. Eminently satisfactory results may be obtained in adult life. Even in the case of adults the more heroic methods of operation in many cases are not called for.

8. The prognosis in paralytic cases will vary according to the nature and degree of paralysis. McKenzie (*Canada Jour. of Med. and Surg.*, May, '99).

Pes Equino-varus.—In simple varus the foot is turned inward. The cases, however, usually have the heel more or less drawn up, and the affection is then designated equino-varus. The affection is usually congenital, both sides being generally affected. The acquired form results from disease of the bones or else paralysis—sometimes cerebral, but oftener spinal. In the congenital form treatment should be instituted as soon as the affection is discovered. The worst cases met with are neglected cases or those in which treatment has been inefficient. It is natural for the feet of an infant to turn inward rather than outward; therefore an outward deformity is more apt to attract attention than is the affection we are now considering. The fact that the feet are turned in a little more than is usual or that they are kept more persistently inward than they ought is a circumstance apt to be overlooked. The child does not attempt walking for several months and therefore careless parents allow the deformity to continue until it interferes with the child's efforts to walk. The infant's foot is largely cartilaginous, and on that account is more readily molded into proper form than when the child is older. It is on this account that treatment should be commenced as soon after birth as possible. This softness of the infant's foot also prohibits the use of severe measures;

its shapelessness also renders it impossible to apply apparatus in the form of shoes, and even other appliances are only retained for any length of time with difficulty.

Talipes equino-varus is always an avoidable condition, and the relapses are generally due to carelessness on the part of patients and friends and sometimes on the part of the practitioner. Robert Jones (*Med. Press and Circ.*, July 3, '95).

Literature of '96-'97-'98.

Equino-varus occurs in locomotor ataxia and in Friedreich's disease, but is the result, not of bony changes, but of abnormal muscular action. The primary disease is so serious and disabling that the question of treating these secondary affections is not often a practical one. Mechanical treatment may, however, be considered with three objects in view: 1. To give firmness to the foot and ankle and direct the sole to the ground. 2. To give lateral support to a Charcot knee. 3. To stiffen the knees by the use of automatic joints, in order to prolong the period for which locomotion was possible with the aid of crutches. A. B. Judson (*N. Y. Med. Jour.*, Nov. 26, '98).

Treatment.—In the treatment of congenital equino-varus in infants of from one to three months of age the main reliance must be placed on manipulations or stretchings. This stretching consists in endeavoring to straighten and replace the foot in its normal position by manual force. It is to be done by the mother or nurse three times daily. The following is the method of performing it: The leg is grasped, close down to the ankle-joint, by the left hand; the anterior portion of the foot is then twisted or rotated outward with the right hand, so as to first overcome the condition of varus present. This having been done the foot is flexed on the leg so as to stretch the tendo Achillis. In other words, the foot is first twisted outward until the ball of

the big toe is in line with the internal malleolus and side of the leg and then flexed on the leg to bring down the heel. This is to be done several times at one sitting morning, noon, and night. In very young infants this is to be the only treatment instituted. If the infant is a little older and robust, and the foot well developed the stretching can be done morning and night and on its completion a bandage may be applied. Flannel is best: from the toes to the knee. This has a distinct influence in correcting the deformity. If the child is older—say about the age of three months and even, in some cases, earlier—the bandaged feet may be placed in ordinary right-angled splints made of tin or felt. These should be padded with a little cotton and the bandaged feet placed in them. The heel should be brought down as well as possible by pressing the sole of the foot down on the splint and holding it there with one hand while the bandage is applied with the other. It facilitates matters to have one person hold the foot in position in the splint while another applies the bandage. As the child increases in age another method is useful. It consists in first bandaging the foot and leg in several thicknesses of flannel bandage (leaving the toes exposed for observation) and then applying over all a plaster-of-Paris bandage. The foot is to be held in the corrected position while the plaster sets. Too much should not be attempted at the first trials and one should see the child soon after the application of the bandage to see that the latter is not too tight. The toes constitute a fair guide: if these are pinkish and not blue and swelled one may be assured that the circulation is satisfactory. This bandage should not be left on longer than a week. On its removal the foot is to be bathed with

whisky and alum or alcohol. Repeated applications of the plaster-of-Paris bandage will in a short time cause such improvement that if the child's foot is sufficiently developed some sort of permanent appliance may be tried. The most common appliance is a shoe fastened to side-irons, which are hinged at the ankle. An elastic band goes from the foot to one of the side-irons and tends to flex the foot on the leg and thus bring the heel down. The shoe is laced down to the toes and a strap passes over the instep to hold the foot in place while the shoe is being laced. This brace should be removed daily, the feet bathed, and the brace reapplied and worn at night as well as during the day. In severe cases better command of the foot will be obtained by continuing the side-irons above the knee, a joint being inserted at the latter point.

Another form of splint, instead of the ordinary right-angled gutter-splint above mentioned, consists of a foot-piece cut in the shape of the foot and made out of quarter-inch-thick board. To this is fastened an iron upright which goes up alongside the leg, and encircles it halfway around just below the knee. The foot is firmly strapped to the foot-piece by means of adhesive plaster and covered with a bandage, which is carried up to the knee. The iron upright is then bent backward and its upper part hooked around the back of the leg, and the whole covered with the remaining portion of the bandage. This is to be changed every few days, and if the adhesive plaster causes soreness of the foot the latter is to be first covered by a bandage and then strapped with the adhesive plaster to the foot-piece. Recently I have modified this splint by inserting a joint at the ankle and fastening the upright to the foot-board by means of a

hinge-joint. The iron goes up the inner side of the leg and a light rubber tube passes from the outer side of the iron upright at the knee to the outer side of the foot-board well forward. By its constant traction the elastic tends to correct the deformity.

The question of tenotomy will arise. In very young infants it is better not to resort to tenotomy at once. In many cases after a few weeks' treatment it will be found unnecessary. In some infants the deformity is so firm and resistant as to make it practically impossible to keep the braces or splints on or to bring down the heel. In these cases no hesitation should be felt in resorting to tenotomy. Usually a tenotomy of the tendo Achillis will be sufficient. In older and more rebellious cases tenotomy of the anterior and posterior tibials in addition to the tendo Achillis will be required. Also at times the contracted plantar fascia should be divided.

When the child attempts to walk, a walking-shoe should be ordered. This is similar to the night-shoe, except that it is made stronger and more suitable to stand the wear and tear of continued use.

As cases grow older so do the difficulties of treatment increase: The feet should be put up in plaster of Paris and held as nearly as possible in the corrected position until the plaster sets. After a few weeks' trial, if satisfactory progress is not made, tenotomy should be performed and the plaster reapplied until later on walking-shoes may be worn.

In still more severe cases more radical procedures are sometimes demanded. Of these the open section of the tissues of the inner side and sole of the foot as advised by A. M. Phelps may be tried. The cases of excision of the astragalus alone for equino-varus which have come

under my notice have not seemed to me to be satisfactory. In those cases in which it brought the foot into fairly good position less radical measures would probably have been sufficient, while in the bad cases the deformity persisted, even after the bone had been removed. This is only to be expected because in equino-varus both the inner and outer arches are disturbed, while removal of the astragalus simply affects the inner arch.

In the most severe cases, those varying in age from six years to adult life, I have resorted to wedge-shaped resection. This is done by making an incision over the cuboid and anterior part of the calcaneum and then gouging out the bone clear across the tarsus. The parts removed consist of the anterior part of the calcaneum and astragalus and either the whole or part of the cuboid, scaphoid, and the three cuneiform bones.

Procedure advocated for treating talipes, by which opening the joints of the tarsus avoided. The bony parts are first divided in a line a little behind the line of incision in Chopart's operation, and then in a line through the cuboid and three cuneiform bones. The skeleton of the foot is then in three distinct pieces, and can be molded into whatever shape is required. McCormick (New Zealand Med. Jour., Jan., '93).

Talipes Equinus.—In talipes equinus the heel is elevated and the patient walks on his toes after the manner of a horse; hence the name. It is usually an acquired affection. In infantile paralysis the loss of power in the anterior muscles of the leg allows the unopposed muscles of the calf to draw the heel upward. For a certain length of time after paralysis has occurred the foot can be brought to its normal position, but, if no means are taken toward guarding against drawing up of the heel, the healthy muscles and tendo Achillis will

permanently shorten and thus the deformity will be produced. It is a condition which commonly occurs as a sequence of injuries of the leg. In fractures, particularly if much violence has been done in the neighborhood of the ankle, and attention is not paid to the position of the foot, when the time comes for the patient to walk the foot will be found to be more or less firmly fixed in the position of equinus. Again, after injuries of the deep structures of the back of the leg the same condition is produced. Cicatrices will not infrequently draw the heel up.

Treatment.—The treatment in cases in which this deformity is liable to occur should be directed to preventing it. In cases of infantile paralysis patients with toe-drop are liable to suffer from contraction. In order to avoid this an efficient brace can be worn consisting of a sole-plate and two side-irons (or even one) with a joint at the ankle which prevents the foot's being extended to more than a right angle. It may be made to be worn inside the shoe or outside and fastened to the sole. In cases of injuries and fractures some splint or appliance should be used which prevents the heel from being drawn up. If the condition is already present when the patient is seen, if it is not too resistant, massage and manual stretching followed by the application of a right-angled splint will suffice to bring the foot to a normal position. This once accomplished, a walking-brace should be prescribed or a light firm splint—such as can be made of leather or silicate of soda—may be used to hold the foot at right angle. When the affection is of longer duration the tendo Achillis should be divided and the case treated as already detailed.

In old cases the plantar fascia will be found contracted as well, oftentimes, as

the tendons of the toes. These should all be divided, the toes flattened out, the foot unfolded, and the heel brought down. In cases which have resulted from paralysis of the leg-muscles particular care should be taken not to unduly lengthen the tendo Achillis, or else control of the foot will be much lessened and walking will be made worse.

In proper cases the removal of a wedge of bone from the tibia and fibula immediately above the ankle-joint advocated, in preference to tarsotomy, for the purpose of removing equinus, which will not yield to milder measures. Reginald H. Sayre (Amer. Medico-Surg. Bull., Dec. 15, '95).

Talipes Calcaneus.

Diagnosis.—This may be either congenital or acquired. The foot is drawn up toward the leg and the heel is down. Division of tendons in these cases is not often required; all that is necessary is to apply some sort of splint or brace that will maintain the foot at a right angle. If the case is a walking one an apparatus with an ankle stop-joint that allows extension, but not flexion, will be required.

Shortening of the tendo Achillis may be performed in these cases. The tendon should be divided obliquely and the ends overlapped and fastened with a couple of fine silk sutures—introduced back and forth, as in a mattress-suture. The wound should be closed without drainage and the foot placed in a splint.

Pes Cavus.

Diagnosis and Treatment.—In certain cases of paralysis the heel assumes the position of calcaneus, as above described, while in addition the anterior leg-muscles are paralyzed, thus allowing the toes to drop. This condition allows the heels and toes to come closer together and consequently relaxes the normal tension on the plantar ligaments. This tendency is aggravated by the action of the an-

terior and posterior tibials, which, if healthy, will draw the arch of the foot up. Thus is brought about a hollowing of the sole of the foot, which is called pes cavus. The arch is raised, while the toes and heel are depressed. In treating it several indications are to be met: To aid in straightening out the contracted arch the plantar fascia should be divided. The anterior and posterior tibial muscles should not be divided, because in these feet there are already too many disabled muscles. An attempt may be made to shorten the tendo Achillis as detailed under the head of talipes calcaneus. To keep the toes from dropping a steel sole-plate and side-iron brace should be used with a stop ankle-joint allowing flexion, but not extension beyond a right angle. To keep the foot flat on the sole-piece a strap should pass from side to side over the instep, or else particular pains should be taken to lace the foot firmly down in the apparatus. I have also used in these cases an apparatus with a vertical steel spring, which allowed a certain amount of both extension and flexion and then brought the foot to a right angle. A. M. Phelps has improved this appliance by adding a stop-joint that prevents sudden excessive movements from breaking the spring.

Pes Planus (Flat-foot).—Flat-foot consists in the flattening of the arch of the foot. It is usually, but not always, accompanied with pronation. Lovett has described a condition in which the symptoms of flat-foot are present with the exception that the arch does not appear to be flattened; to this he has given the name of the "pronated foot"; as its symptoms and treatment are practically those of a mild or early stage of flat-foot, it is included under that subject.

Flat-foot most often occurs in young

children and adolescents, but is also common in adults. It has two principal causes: general weakness and rheumatism. There is a disproportion between the strength of the foot and the use it is subjected to.

This balance in the young is usually disturbed by the bodily weakness to which children are so often subject. The weakness of the muscles throws additional strain on the ligaments, and these consequently stretch and let down the arch. While some patients may exhibit evidences of trouble in other parts of the body, this is often not the case, and the flattening of the arch may be the only evidence of disease that can be detected.

In adults the weakness of the foot is due to pain's lessening the efficiency of the muscular support and to the rheumatic disease of the fibrous structures lessening their ability to perform their function. Patients in moderately fair condition, both generally and in respect to the feet, may have their strength overtaxed by excessive use. Thus, children working at occupations requiring them to stand continually, as weaving, will become affected.

The feet of the infant at birth are not flat. A body of fat develops under the arch, which gives the appearance of flat-foot for some years. At the age of four or five years this is absorbed. R. W. Lovett and John Dane (N. Y. Med. Jour., Sept. 28, '95).

Analysis of a thousand cases of the so-called flat-foot. The following propositions are presented: 1. The normal foot may be made to assume an attitude resembling that of the so-called flat-foot. 2. The deformity of flat-foot is a permanent exaggeration of a normal attitude. 3. This passive attitude that simulates deformity may be simply the result of habit. 4. Weakness may be prevented by guarding the foot from injury and improper use. Royal Whitman (N. Y. Med. Jour., Nov. 9, '95).

Symptoms.—Pain and discomfort are the symptoms most complained of. This may be located generally in the foot, it feeling tired; or it may be localized, common points being often below and in front of the inner ankle, or on the dorsum near the ankle and in the instep generally. The sole of the foot becomes flattened out instead of preserving its natural hollow form. The instep sinks, and the foot on that account looks longer than it really is. It also becomes stiff, losing its flexibility. The peronei muscles along the outer side of the ankle are often in a state of spasm and can be felt as hard cords along the lower end of the fibula and ankle. In rheumatic cases the foot usually looks thicker than normal; this is a characteristic sign, as it shows actual disease present. Pain is marked: often it can be elicited by moderate pressure over the bones and ligaments. Pain in the heel is another characteristic sign, and pains in the soft parts are apt to be present as well as in the bones and ligaments. Another important sign is a sweaty condition of the feet. The age of the patient also aids in diagnosis, and a history of rheumatism or pains in the other joints can often be elicited.

Injuries comparatively rarely cause the affection. Infantile paralysis may cause it, and, if so, other evidences of paralysis will usually be present.

Treatment.—The general health should be attended to. Diathetic disorders—such as rheumatism—should receive attention. Any exciting cause—such as excessive work, the wearing of improper shoes, or anything else that may tend to produce or aggravate the conditions—should be remedied. In the young, tonics should be given to build up the general health: strychnine, the hypophosphites, codliver-oil, quinine,

and iron may be given. If the patient has been too closely confined in-doors, then a more out-of-door life is to be advised. In endeavoring to improve the local condition it is a good plan to order the patient to rest in bed for a week or two. This cures the pain at once and the spasm of the peronei muscles subsides. Then daily massage and manipulation should be given. This manipulation should have as the main purpose replacing the broken-down arch in its former normal position. To do this the forepart of the foot is grasped with one hand and rotated from the outer toward the inner side. At the same time pressure should be made with the other hand on the sole of the foot below and slightly in front of the ankle so as to press the arch up. These two movements should be repeated many times twice daily—morning and evening. The foot should also be moved backward and forward so as to unlock the tarsal bones and render the foot more flexible. When the foot has been loosened up, the arch partly restored, and the pain gone, then the patient may be allowed to get out of bed. To strengthen the muscles the patient should be told to stand on the toes, raising the heels off the floor as far as possible, several times a day.

Employment of the bicycle advocated in the treatment of flat-foot, as it affords needed exercise to the most debilitated muscle-groups controlling the ankle, with the foot in a favorable position and with superincumbent weight largely eliminated. Brundelli (N. Y. Med. Jour., Aug. 10, '95).

To relieve the strain on the arch the weight of the body should be thrown on the outer edge of the foot. This is accomplished by raising the heel and sole on the inner side a quarter of an inch or more, also by using some additional mechanical support. This mechanical sup-

port may be given either by a separate insole or plate which is inserted into an ordinary walking-shoe or by a shoe which is specially constructed for the patient.

In some cases metal plates or insoles work well, but they are often unsatisfactory, and on that account in all serious cases and in many others I prefer a specially-constructed shoe. The plate usually used consists of a sheet of metal, of the shape of the foot, which has been worked up on its inner edge so as to support the arch. In order to support the outer side of the foot and prevent it from sliding outward away from the plate Royal Whitman has added a projection on the outer side. A leathern insole braced with a metal strip can also be bought of instrument-makers. The objection to metal sole-plates are that they are hard to fit and be made comfortable, they require the use of a specially loose shoe, and many of them are liable to rust and break. Practically the only way of preventing the latter is to have them coated with hard rubber after being specially fitted to the patient, or to use some special, non-corroding metal. The shoe which I prefer is made on these lines: a steel shank is inserted between the layers of the sole, over this at the part of the foot which it is desired to support is placed a small pad so shaped as just to fill the hollow of the restored arch. The counter of the shoe is made extra strong, the inner edge of the sole and heel are raised a quarter of an inch, and if the case is an exceptionally bad one a small side-plate is riveted on the sole-plate and goes up on the inner side of the foot for an inch or two. This is covered by sewing over it a piece of leather. The shoe is to be a laced one, and not buttoned. In severe cases a side-iron may be added to this shoe, or

an inside plate with side-iron and joint at ankle may be used.

Tenotomy of the peronei tendons may be performed, but rarely for cases in which spasm is quite marked.

Literature of '96-'97-'98.

Celluloid plates advocated for flat-foot soles. The thickness of the sole varies from one and a half to four millimetres. For men this should be strengthened by portions of celluloid dissolved in acetone. Kirsch (Centralb. f. Chir., No. 35, '96).

Pes Valgus.

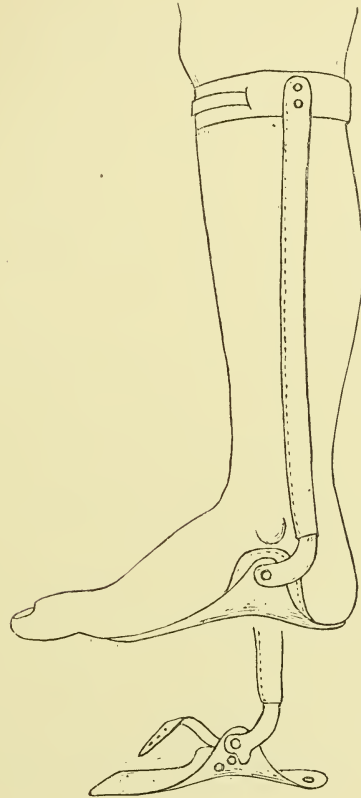
Diagnosis and Treatment.—In valgus the foot is turned out instead of in. It is almost always an acquired affection and associated with calcaneus, as in cases of pes cavus already referred to. Its treatment is a combination of that used for pes cavus and pes planus. The tendency for the foot to turn out is overcome by using an apparatus with a steel sole-plate, and any tendency to too much flexion or extension is counteracted by a stop-joint. The brace can either be fastened to and incorporated with the sole-plate or the brace can be separate from the shoe and used inside of it. An advantage of the latter is that it may be used with different shoes, but it is not so efficacious as the former.

Knock-knees.

In knock-knees the legs, instead of being straight in line with the thighs, are inclined outward from the knee-joints. This causes the feet to be wider apart than natural and the knees closer together, so that in walking they knock against one another and interfere in walking; whence the name.

It is caused by an increased obliquity of the lower articular surface of the femur, together, usually, with an increased laxity of the ligaments of the knee-joint. The internal condyle of the

femur projects downward farther than does the external. The increase in the internal condyle is on its lower, and not on its posterior, surface; so that the deformity manifests itself when the legs are extended. When they are flexed they assume their normal position and nothing unusual is to be seen except, in



D. W. Kolbe Co.

Brace for flat-foot, also for toe-drop from infantile paralysis. (G. G. Davis.)

marked cases, the projection of the internal condyle. The increased length of the internal condyle is not caused by a more rapid growth of the extremity of the condyle itself as of the whole substance of the inner side of the femur, for the epiphyseal cartilage is not transverse to the long axis of the femur, but is tilted so as to be almost parallel to the

joint-surface. Associated with this condition of the bones is also a laxity of the ligaments of the joint, particularly those on the inner side.

Etiology.—The causes are usually malnutrition, weakness, or rickets, and the affection is often precipitated by some affection of the foot.

Literature of '96-'97-'98.

For all cases of genu valgum requiring osteotomy it is better surgery to operate upon the tibia, and not the lower end of the femur. In the majority of cases of knock-knee sciagraphs will show that the essential condition is a curve outward in the bones of the leg, and not an elongation of the internal condyle or outward curve of the lower end of the femur. C. A. Morton (Brit. Med. Jour., Nov. 15, '98).

Thus when rickets plays a prominent part we find the disease occurring in childhood. When weakness acts as a cause we find it occurring in adolescents somewhat in the same manner as does lateral curvature or flat-foot, but earlier than these two affections. It is often associated with flat-feet, and it can readily be seen how the letting down of the arch of the foot tends to throw the knees inward. This influence, continuing for a long time, at last makes itself evident on the structure of the joint. A condition of valgus occurring from traumatism or other cause as paralysis may cause the development of knock-knee, but if there is no constitutional weakness these affections may exist without giving rise to any knee-troubles.

Symptoms.—If the condition is once suspected and looked for, there is usually no difficulty in diagnosing it, but it is liable to be overlooked. Attention is apt to be first attracted by either the child's stumbling and falling or else by its awkward gait. In very young children they

will begin to stumble and fall frequently or acquire a sort of waddling gait, and this after they have been walking naturally for some time. If on examination flat-feet are found, these may be subjected to treatment and the knees' condition be entirely overlooked.

Prognosis.—Knock-knees is not so apt to improve with growth as will bow-legs, neither does it respond so readily to treatment. On this account operative measures are more early resorted to.

Treatment.—The general constitutional condition of the patient should be attended to and remedies—such as cod-liver-oil and syrup of the hypophosphites—given. Hygienic and dietetic measures are also important. Considerable can often be accomplished by mechanical means, particularly in children under the age of six years, when the deformity is not too pronounced.

The form of apparatus usually employed consists of a waist-band to which are fastened two leg-irons: one going down on the outside of each leg and fastened to the shoe with a joint at the ankle. The knees are pulled outward toward the leg-irons by straps. Sometimes joints are introduced at the knees. When this is desired greater stability and efficiency is insured by having irons up each side of the leg instead of only the outer. A pad is placed on the inside of the knee and the braces are straightened, with wrenches from time to time as necessity requires. It is necessary that the leg-irons be firmly fastened to the shoe and that the shoe itself be strengthened so as to guard against an increase in the tendency to valgus.

When the deformity is marked or the parents are unable to give the case the attention which treatment by means of apparatus entails, then resort may be had to operative means.

The operation employed is division of the bone, or osteotomy. Macewen inserts the osteotome on the inner side about a finger's breadth above the tubercle for the adductor-magnus muscle. The division is effected from within outward. The knee should be bent, as the artery is farther away from the bone in that position. Some make an incision through the skin through which the osteotome is introduced; this is not necessary. A better way is to place the edge of the osteotome on the skin at the desired spot and then by a gentle rocking motion cut through the skin. After completion of the operation a large dressing of gauze is applied, but no sutures need to be inserted. The legs are put up in a somewhat overcorrected position, either in plaster of Paris, which is best, or splints. Hahn advocated division of the bone on the outer side, and I much prefer it, because the bone is divided on the concave side instead of the convex, thus leaving a bridge of bent bone and periosteum to prevent undue displacement of the fragments, besides being easier of performance. The operation of Macewen, however, from the inner side is the one usually recommended. Cuneiform osteotomy with the removal of a wedge of bone is never done for this affection.

Bow-legs.

In bow-legs the concavity of the curve is on the inside instead of the outside of the limbs. Thus, the knees are unduly separated, instead of the feet. The bending, also, is commonly more gradual instead of angular as in knock-knees.

The causes are much the same, but the affection usually occurs between the ages of one and six years and less frequently in older subjects. It is more commonly, also, of a distinct rachitic origin. The appearance of the limbs of

the patient is so marked that it is less apt to be overlooked than is the case with knock-knees. In the latter affection, as has been said, a position of valgus is often assumed by the foot. This is turned so as to enable the sole to be placed flat on the ground. In bow-legs the sole has a tendency to incline inward; so that in order to bring the sole flat on the ground the feet are widely separated; therefore the feet are very far apart as well as the knees, and this gives a peculiar appearance to the patient, which is at once remarked by the parents.

The bowing may involve the tibia and fibula alone or the femur in addition. The knee-joint itself is not often affected. The curve is not always a lateral one, but may be in an antero-posterior direction, often combined with lateral bending.

Treatment.—The line of treatment to be pursued depends on the age of the child and extent and character of the deformity. As the nutrition of the patient is almost always at fault, particular attention should be paid to it. As it is evident that the child has not grown satisfactorily on its previous feeding and mode of life, the usual diet should be changed and the child be gotten out in the open air as much as possible and codliver-oil and hypophosphites given internally or the former rubbed thoroughly in the skin daily.

In endeavoring to straighten the limbs by non-operative mechanical means the child may either be kept abed or allowed to walk around. If it is desired to obtain the greatest possible correction in a short time the child is to be kept in bed and the limbs bandaged to each side of a splint placed between them. When the curvature is confined to the bones of the leg a very efficacious method is

the following, which I devised some years ago: A pad is placed between the ankles, and these are then firmly fastened together with a bandage; another pad is placed between the knees, and they likewise are bound firmly together. The legs are then covered with a plain muslin bandage and directly across from one leg to the other at the point of greatest curvature is placed a rubber bandage. This by its continuous pressure tends to obliterate the curve. Care should be taken not to apply the rubber bandage too tightly.

If the child is to be allowed to walk around freely braces must be employed. These are often made of a single inside bar. This form, however, is not so firm, nor does it make so efficacious pressure as does a double brace. It is best to have a brace made with two side-irons jointed at the ankle and knee. A pad is placed over the inside of the ankle, another at the knee, and a third on the opposite side of the leg. By bending the apparatus every few weeks any desired degree of pressure can be obtained. It is highly desirable to carry the apparatus above the knee so that rotation be prevented. A fairly efficient apparatus can be made for very young children without any ankle-joint, as it is hardly so essential in them as in adults.

In cases of antero-posterior curvature an apparatus with two side-irons and a pad strapped over the projecting bone and fastened to the side-irons is of service, but the results are not so good as in lateral curves. In young children with soft bones correction can be effected by manual force and the limb placed in a plaster-of-Paris dressing.

In more stubborn cases osteotomy or osteoclasis may be utilized. Personally I do not like osteoclasis, and prefer an osteotomy. This can be done through

an opening sufficient only to admit the chisel. To break the bone I prefer an osteoclast to manual force, as it necessitates less division of bone. The bone is thus accurately broken at the desired spot without undue violence.

In antero-posterior curvature it is very often necessary to resort to a wedge-shaped resection of bone; this is an operation of considerable gravity, and the utmost care must be taken to employ a reliable aseptic technique.

Hallux Valgus.

This is a displacement of the great toe outward; it is usually associated with enlargement of the bursa and tissues on the inner side of the metatarso-phalangeal joint. In its most marked condition the cause is usually rheumatic or rheumatoid in nature, although severe cases occur even when no other symptoms pointing to those affections exist.

Literature of '96-'97-'98.

From a clinical point of view, it is of importance to notice that the sheath of the flexor longus hallucis is bound down in the sole and behind the ankle by a dense fibrous covering, but in the upper part it is only surrounded by loose cellular tissue, and in this situation it is capable of great distension. Another circumstance of clinical importance is the existence of a communication between the sheath of the tendon of the tibialis anticus and the cuneo-metatarsal joint. *Chemin (Comp. Rend. des Séances de la Soc. de Biol., '96).*

TREATMENT.—Conservative treatment may be tried with a small internal lateral splint of pasteboard to which the toe is drawn over by adhesive plaster or by means of a metal spring fastened to a sole-plate and made by the surgical-instrument maker. Radical treatment consists in excising the hypertrophied and inflamed tissues over the projecting part and removal of the head of the

metatarsal bone. Care should be taken not to remove too much, or a flail-joint may be left and walking interfered with. For this reason it is preferable not to remove both articular surfaces.

Osteotomy of the metacarpal bone has been done, but it is only effective in comparatively mild cases.

Coxa Vara.

This is the name given to a condition in which the neck of the femur is so altered in relation to the shaft that the direction of the thigh is changed. The foot thus may be abnormally everted, and excessive adduction be present, producing a scissors-like deformity.

Literature of '96-'97-'98-'99.

Twenty-two cases of coxa vara. It is much more common than is supposed, and many cases are treated as cases of tubercular disease.

Coxa vara is to be detected only by physical examination. The points developed are: the trochanter is elevated, prominent, and displaced, as may be demonstrated by Nélaton's line and Bryant's triangle, the actual shortening of the leg, and the peculiar and unequal limitation of the range of motion dependent upon the deformity. In progressive cases the forced passive motion causes discomfort, and at times it may be resisted by voluntary and involuntary contraction of the muscles. This is, however, unusual. There is commonly a certain amount of muscular atrophy, more marked in the thigh than in the leg, which corresponds to the duration and to the degree of the disability.

Coxa vara is probably the result of an inherited or acquired weakness, either of position or structure; it may be the important predisposing cause of the deformity. Exciting cause would be the instability of rapid growth, overstrain, overweight, and injury. Improper surroundings, insufficient nourishment, or debility from any cause undoubtedly lessen the resistance of the bones as of other parts, but the presence of actual

local disease is by no means necessary to explain the deformity. Whitman (N. Y. Med. Jour., Jan. 21, '99).

Osteotomy may be necessary to obviate some of its discomforts and disabilities.

Literature of '96-'97-'98-'99.

Preventive treatment of coxa vara, if diagnosis has been made in the early stages, may succeed, by use of perineal crutch and removing the strain of overexertion, in checking its progress. This should be accompanied by massage, passive motion, and a limited amount of exercise, with passive forcible manipulation of the leg in the direction of limited motion.

Operative treatment consists in correcting the deformity by removing a cuneiform section from the base of the trochanter. This operation is seemingly indicated in cases occurring in early childhood. Linear osteotomy below the great trochanter is sometimes valuable in enabling one to correct marked deformity. Whitman (N. Y. Med. Jour., Jan. 21, '99).

Hammer-toe.

This is a permanent contraction or cramping of one or more toes in which they project up above the rest. Corns form on top, owing to rubbing of the shoe.

[Hammer-toe usually affects the second toe. While it is doubtless true that some infants are born with a decided tendency to this deformity, it is still possible that it is due to narrow-toed shoes of the parents. T. G. MORRIS, Assoc. Ed., Annual, '89.]

TREATMENT.—The most effective and surest remedy is to amputate the toe at the metacarpal joint. This may seem radical, but, while, by dividing the flexor and extensor tendons and even the lateral ligaments, the toes may be straightened, still in a few months the deformity is apt to recur.

If resection of the joint is performed

it is apt to leave a wobbly, loosely-attached, toe which tends either to be pushed up above the level of the other toes or else to become caught under one of the toes on either side and form a condition of affairs as annoying as was the original affection.

Webbed Fingers.—When these are congenital they may be cured by raising a wedge-shaped flap from the base of the dorsal aspect of the web and slitting up the remainder. The flap is then turned in between the fingers and sutured in the palm and the raw surfaces on the sides of the fingers approximated as much as possible.

The essential part of all operations for this affection is to get a healthy strip of skin to heal nicely in the base of the web, thus preventing a cicatricial band's forming at this point.

Club-hand.—This term is applied to a rare condition of the hand corresponding to club-foot. It may be congenital, as a result of defective development, or may be caused by any traumatism capable of inducing paralytic contraction. The congenital variety is usually associated with deformity of the lower end of the radius or ulna and with other congenital malformations. The hand may be fixed in extreme flexion or extension, or it may be deviated laterally, thus constituting varieties resembling those observed in club-foot. In the majority of cases, however, the hand is drawn toward the radial side and flexed.

TREATMENT.—Passive motion and persistent efforts to place the fingers and hand in their normal position, a retentive apparatus or plaster dressing being used, are sometimes followed by improvement. Frictions and galvanism of the muscles involved tend to assist the curative process. Tenotomy does not

enjoy the confidence of surgeons, as a rule, and is thought by many to be more harmful than beneficial.

In club-hand, section of the tendons, ligaments, or fascia may be necessary if the case is not seen in the early stages. If the flexor tendons have to be divided, it would seem better to operate in the forearm instead of the hand, and to split the tendons longitudinally, and, after having gained the required additional length by sliding the ends past each other, to suture them together once more. Bilhaut (*Annales d'Orthop.*, May, '93).

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OSSEOUS SYSTEM, DISEASES OF.

Periostitis.—Inflammation of the periosteum.

Symptoms.—In an ordinary acute periostitis following injury there is a localized swelling, redness, heat, and pain—which is usually worse at night. The tenderness is exquisite and the use of the part is much interfered with. A spindle-shaped thickening can often be felt, often due to detachment of the periosteum from the underlying bone. The anterior surface of the tibia, being most exposed, is the most frequent site of the trouble. When no infection occurs from purulent micro-organisms, suppuration may not occur. If, however, the acute form supervenes during some infectious disease, suppuration is apt to take place, and constitutional symptoms—severe in proportion to the extent of the inflammation—ensue. Diffuse periostitis is a serious variety in which the inflammation spreads rapidly, sometimes including the periosteum of the entire shaft. It may reach the epiphyses and the joints and reach deeply into the osseous tissues, as far as the medulla. Pyæmia sometimes appears in these cases and generally ends fatally.

Periostitis frequently follows injuries; it may also arise spontaneously as a sequel to variola, typhoid fever, scarlet fever, and other infectious diseases. The complication, as a rule, however only occurs at the end of convalescence. After typhoid fever the tibia is usually implicated, and the jaws after scarlatina and measles. Periostitis more frequently occurs as a complication in the young than in the adult.

It may be primary or secondary as the result of inflammation of the underlying bone or the medulla. In syphilitic and tuberculous subjects a local periostitis may arise without any discoverable traumatic cause. It is probable, however, that in many of these apparently idiopathic cases there has been a previous unnoticed trauma, but of a degree which would not have affected a healthy periosteum.

Pathology.—The morbid changes consist in a temporary thickening of the periosteum, followed by rapid cell-proliferation and the formation of inflammatory lymph. The parts may remain thickened or hardened (sclerosed), though the underlying bone, through defective nutrition, becomes soft. Diffuse inflammation so reduces the osseous nutrition sometimes as to cause death of bony areas: necrosis. (See *OSTEOMYELITIS*, farther on.)

Treatment.—Many cases of periostitis are kept active by the continued irritation of the part through lack of rest. The muscles being inserted in the periosteum, their contraction disturbs the latter, and the periostitis cannot subside. The first indication, therefore, is to order the patient off his feet. Not only should this be done, but all movements of the affected member should be prevented by incasing the limb in a plaster-of-Paris

dressing or securely bandaging it to a splint.

Local depletion is also efficient. Leeches may be applied or multiple punctures of the swelling may be made with a slender tenotome or cataract-knife. Instead of these punctures, a subcutaneous incision may be made through the swollen tissues down to the bone. In chronic, troublesome cases in which the upper layers of bone are involved, making an incision down to the bone and then boring several small holes into it—the aim being to relieve tension—and finally putting the limb in plaster of Paris has been followed by the most gratifying results in my hands. To wait for the formation of pus in these cases before operating is, in the highest degree, undesirable, as an earlier boring of the bone cuts short the disease at once and prevents the occurrence of suppuration.

Ostitis.

Inflammation of the osseous tissue proper is seldom, if ever, witnessed as a primary affection and without involvement of the medulla. The osseous structure is often involved, however, in periosteal and myelitic disorders. The symptoms are described under *periostitis*, but they are somewhat more marked as regards pain and tenderness, while greater ambulatory impotence exists.

Etiology and Pathology.—After a bone injury, as in the case of fracture, blood and serum are effused at the affected spot. The periosteum and surrounding parts become infiltrated with leucocytes. From the periosteum and the adjacent bone stellate cells are proliferated. The effusion in which they occur becomes first hardened and striated and lime-salts are deposited. The stellate cells become full-fledged osteo-

blasts, which finally develop into bony tissue. In cases resulting from simple injury the natural state of affairs is soon re-established, but occasionally an anomalous course is pursued. The bone may become uniformly increased in all dimensions, constituting a true *HYPEROSTOSIS*, or, if the density is increased as well as thickness, an *OSTEOSCLEROSIS*.

In this disorder the bones of the head are most often affected, and the disease

[In a case, aged 26 years, observed by me, the patient noticed that her nostrils were growing shut when ten years of age, the nose gradually growing broader. There was evidently an increase of bony tissue on the face from the eyes downward, and the nostrils were blocked shut with bony masses. The posterior nares were practically normal, while the lower jaw was enlarged on its anterior surface, but not the posterior one, giving her face a peculiarly massive appearance. The increase in the size of the jaw took place within the past year and has been rapid. G. G. DAVIS.]

OSTITIS DEFORMANS.—This is a disease described by Sir James Paget in which many of the bones of the body are affected with osteosclerosis. A large proportion of the cases die from malignant disease.

Forty-one cases of *ostitis deformans* have been reported. It is manifestly a distinct general disease, arising from nutritive disturbances, although the cause is yet unknown. The frequency with which the disease is followed by malignant tumors emphasized. Thibierge (*Arch. Gén. de Méd.*, Jan., '90).

Ostitis deformans, according to Hutchinson, chiefly belongs to the senile periods of life; it may occur in either sex, but is more frequent in men; it often happens to those who have a gouty family history. It consists of a process of *ostitis* and *periostitis*, attended by the abundant formation of ill-developed new bone and the weakening, to some extent, of the old. It is often in the early stages restricted to one bone, and tends in all cases to become generalized, involving all the bones of the body. It has no connection with syphilis, although it may be stimulated by it, especially by the hereditary form, and it runs a very chronic course, lasting ten to twenty years. Of itself, it rarely causes death.



Leontiasis ossium. (Sutton.)

may last many years. When *ostitis* attacks the bones of the face a very peculiar appearance results, to which Virchow has given the name *LEONTIASIS OSSIIUM*. The disease begins in youth in otherwise apparently healthy persons and lasts many years.

Leontiasis ossium regarded as a modification of rickets. Case noted in a young man aged 24. Pathological changes of the skull in this case are shown in the accompanying illustration. Sutton (*Illus. Med. News*, Mar. 9, '89).

Osteomyelitis.

Osteomyelitis is an acute inflammatory disease which originates in the spongy and medullary tissue of bone, but not in the compact tissue.

Symptoms.—It usually begins with a chill, soon followed by severe pain in the affected part, sometimes by redness and fluctuation and severe constitutional disturbance, including a high temperature. In young children the disease may traverse the epiphyseal cartilage and affect the neighboring joint. A mild case may be attended by very slight symptoms and proceed to recovery. When the suppurative form is present, however, there may be a prominence over the affected area or a fungous abscess into which the probe readily sinks deeply. Periostitis, which is invariably present, however, may mask the true nature of the case. After the femur and tibia, the vertebræ are the most frequent seats of this affection; an abscess forms which tends to break down the vertebral column, or bring about meningitis and myelitis by penetration, and thus cause paraplegia. Curvature of the spine is seldom observed, however. Severe cases may end fatally as a result of pyæmia or septicæmia.

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Diagnosis of osteomyelitis in infancy is to be made between that of tubercular and syphilitic disease. The following features are considered as distinctive: (1) the multiplicity of the foci in the bone; (2) the frequency of the separation of the epiphyses; (3) the frequent involvement of the joint; (4) the acute course of disease. Swoboda (Wiener klin. Woch., x, 87, '97).

NECROSIS.—Death of bone may not only be due to osteomyelitis, but, also, as already stated, to periostitis. Whatever be its pathogenic source, however, it ensues as a result of defective nutri-

tion due to interference with the supply of arterial blood. This occurs when the medullar or periosteal lesion that may be present leads to destruction of the Haversian canals. At times the deficient nutrition may be due to numerous emboli originating in a remote region—in the heart, for instance, during endocarditis. Metastatic necrosis is also occasionally witnessed in the course of infectious diseases, the result probably of bacillary invasion. Under **JAWS, DISEASES OF**, the necrosis brought on by phosphorus has been carefully reviewed. The influence of malnutrition of osseous tissue is readily shown also in dislocation of the astragalus; notwithstanding its replacement and the fact that no external lesions exist, this bone may undergo necrosis. The influence of fractures is also well known, especially when comminution disrupts its trophic supply.

When a long bone is attacked, the whole shaft may be involved or only that part of the diaphysis near the epiphyseal line. The periosteum forms new bone over the dead tissues or sequestrum and a suppurative tract or sinus leads from the sequestrum through the surrounding shell of bone to the exterior.

Etiology and Pathology.—Osteomyelitis is the result of an infection from one of the pyogenic organisms, either a streptococcus or staphylococcus. The disease is usually started by some slight injury, particularly in children previously debilitated by the infectious fevers.

In the negro race childhood and early manhood are most prone to the disease. Cold, traumatism, and overexertion are frequent existing causes.

Study of 403 cases of acute osteomyelitis of the long bones. Shows that the male sex preponderates over the female in the proportion of 338 to 1. A large percentage, 42, falls between the ages of 13 and 17. Below 6 and beyond 19 there

is considerable decrease; beyond 19, almost extinction. Three-fifths of all cases occur in the larger cylindrical bones, 38 between tibia and femur,—the latter more in the lower third, the former more in the centre of the shaft; 20 per cent. multiple. In 189 of the entire number more or less aggravated disturbance of the adjacent articulations remained. Haaga (*Beit. zur. klin. Chir.*, vol. v, No. 1, '90).

Osteomyelitis may appear during adult life, although, without doubt, much less frequently than in infancy or adolescence; (2) with adults the affection may be chronic from the first, beginning insidiously and progressing slowly; (3) osteomyelitis and osseous tuberculosis may co-exist or succeed each other. Trélat (*La Trib. Méd.*, Mar. 19, '91).

The pathology of bone-necrosis corresponds to that of gangrene observed in soft tissues. Dead bone is separated from living bone by a line of demarkation of inflammatory origin: a rarefying ostitis. This tends to isolate the dead bone, which then becomes a sequestrum. It may, if small enough, be absorbed after undergoing disintegration; if large, it may persist a long time imbedded in pus, which finally finds an issue. The enveloping shell,—the involucrum,—if it contains a sufficient quantity of pus, becomes perforated, and, this perforation leading to the surface, a fistula is formed. The reproduction of bone in necrosis due to simple inflammatory causes is sometimes remarkable when the subject is strong. Indeed, there is sometimes overproduction, elongation of a limb being thus brought about, especially an injury requiring prolonged sojourn in the recumbent position.

Treatment.—When a joint is affected it may first be aspirated; if the effusion is marked or if the case is sufficiently alarming the articulation may be laid open, washed out, and drained or even the joint resected.

In case the long bones are involved free incision and drainage should be resorted to in order to cut short the systemic disturbance and allow time for the periosteum to become sufficiently thickened to allow of its being pushed aside while removal of the affected bone is being accomplished.

In some cases longitudinal section with Hey's saw, and curettage are required to totally evacuate the contents; a small trephine may be used when the accumulation is not readily accessible and the purulent material is thickened.

Necrotic sequestra are readily recognized by the grating sensation transmitted through the probe. They should be removed when free in the cavity, which their mobility will readily indicate. It is usually necessary to enlarge the opening. When the piece is large a gouge or chisel is necessary to thoroughly remove all dead bone. The Es-march bandage should be used to avoid hæmorrhage.

When after the removal of dead bone a long and deep gap is left, an effort should be made to encourage the production of new bone. Bits of human bone will grow and develop if the chips are thoroughly aseptized, but it often suffices to make the transplantation from the bone of a living animal. Animals' bone, ivory, and other aseptic organic materials can be made to become healed in, and absorbed, capsulated, and partially or totally substituted by the growing bone in which they are planted and to which they furnish the irritation for osteogenesis.

Literature of '96-'97-'98.

In osteoplastic filling of bone-defects the following method is recommended: After the sequestrum has been removed and the bone rendered free from all necrotic tissues, the lateral walls are cut

free from the rest of the bone without destroying their attachment to the periosteum; then a sufficient amount of the remaining bone is removed on either side of the middle and posterior portions to provide periosteum which will enable the lateral walls to be brought together in the median line and united by sutures, and yet leave sufficient periosteum to cover the entire bone, with only one line of sutures. The same end is obtained by other osteoplastic modes of operating; for instance, only a portion of the lateral wall is preserved, the upper half being resected and left in contact with the periosteum, while the lower half is removed subperiosteally, and thus supplies the periosteum necessary to enable the upper portions of the lateral walls to unite in the median line and fill out the deficiency.

Near the epiphyseal lines the bones may be cut in wedge-shaped sections and slid toward each other to fill up a bone-defect in the middle third of the shaft. The osteoperiosteal flaps may be formed from one or both lateral walls as the individual case demands. The portions of bone are fastened together by metallic sutures or by strong silk, when the necessary tension is not too great. Care is needed in drilling the holes through the bone, and the author recommends for this purpose the use of the dental engine and drills. Osteoplastic operation should never be performed on the same day on which the sequestrotomy is done. Dressings used in such operations must be occlusive, but not compressive. A. Schul-ten (*Arch. f. klin. Chir.*, B. 52, H. 1, '96).

In cases in which the bone is extensively diseased, or gangrenous osteomyelitis is present, or when through extensive suppuration the patient's life is clearly endangered, amputation is indicated. This is especially the case when a long bone is implicated. In such a case, however, the bone should be removed entire, section in its continuity being, as a rule, followed by recurrence.

Rickets.

Rachitis, or rickets, is a disease of

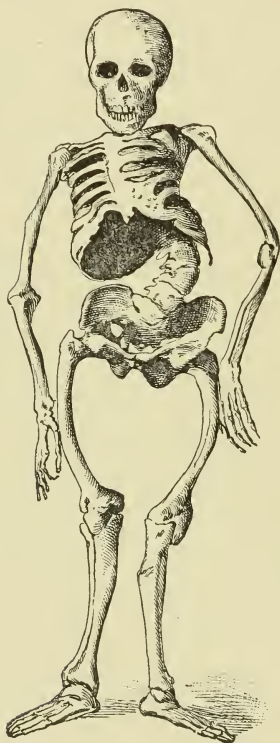
infancy and childhood due to malnutrition of the osseous structures.

Symptoms.—Nocturnal restlessness, night-sweats (especially of the scalp), enlarged abdomen, and phosphaturia are the early symptoms of this affection. The osseous involvement appears soon afterward and consists of epiphyseal enlargements, of which the end of the radius, the ribs, and the vertebræ are the most frequent seats. The costal disorder is followed by the deformity usually called "pigeon-breast." The frontal eminences and other portions of the facial bony frame-work are often enlarged; the fontanelles are frequently patent and the growth is often impaired. Such children are usually susceptible to catarrhal affections of the entire respiratory tract, nose, throat, and lungs. Deformity of the spine and other bones occurs as a result of the softening. Probably the most pernicious effect of this condition is its influence upon the female pelvis, distortion of which when adult life is reached impedes and sometimes totally prevents parturition.

Etiology and Pathology.—The predominating features are that the epiphyseal ends of the bones are thickened, and that the bony tissue which forms is deficient in lime-salts. Hyperæmia of the osteogenetic tissues first causes growth of the cartilage at the epiphyseal line, which becomes enlarged and irregular in histological structure. The bones are so soft that they can easily be cut, and the ligaments are elongated. When curvature of the spine ensues, we have *scoliosis* (see SPINE, DISEASES OF) or *lordosis*; the pelvis may also become *kyphotic*. The skull may become thinned: a condition recognized as *craniotabes*, and its enlargement forms the physical basis of hydrocephalus (*q. v.*). Many of

the deformities considered under ORTHOPÆDIC SURGERY are due primarily to rachitis.

Poverty, unhygienic surroundings, deficient food, artificial infant-foods, dampness, insufficient ventilation, etc., represent the etiological factors which environment procures. Hence the greater prevalence of rickets in crowded



Rachitic scoliotic skeleton. (*Grandin and Jarman.*)

cities, especially those of the poorer countries of Europe, and among our negro population. It usually appears as soon as the child tries to walk, and may be congenital.

Treatment.—In the treatment of rachitis the first essential is to make a positive change in the diet of the patient. Fresh and nutritious foods should replace the ordinary diet, and all prepared

foods for children should be strictly avoided (see NURSING AND INFANT-FEEDING). Codliver-oil is the best medicament. It should be given internally and rubbed into the skin externally. The compound syrup of the hypophosphites and lactophosphate of lime are sometimes of service, but codliver-oil is almost a specific. Hygienic measures, such as out-door life (the patient being wheeled out in a carriage, if need be), salt-water bathing, and residence on the sea-shore are of great value, but unfortunately the latter is seldom within the means of the patient. To prevent the occurrence of deformities and to correct them the child should be kept off its feet and splints or apparatus applied. If the disease is marked, deformities will occur even though the child does not stand on its feet.

Osteomalacia (Mollities Ossium).

This is a softening of the bones in adults which occurs most frequently in nursing-women.

Symptoms.—The early symptoms of this disease are often obscure, the pain and muscular weakness complained of often leading to a diagnosis of rheumatism or suggesting some disease of the spinal cord. The progressive softening of the bones, however, soon leads to deformities, which gradually increase in degree and extent. The bones of the spinal column and the pelvis suffer most, the latter giving rise to great decrease in the pelvic diameters and the former leading to decrease in height. The patient assumes a waddling gait through the pelvic changes. Fracture of the long bones from muscular action is often observed. Death is usually due to exhaustion or pulmonary disease. In rare cases the disease sometimes becomes arrested.

Diagnosis.—While rheumatism may be suggested early in the history of a given

case, a diagnostic point of importance soon supervenes to indicate the true nature of the trouble, namely: the numerous painful areas. The sex of the patient, the possible presence of pregnancy, the presence of lime-salts in the urine, and the peculiar deformities witnessed, all serve to identify the affection.

Etiology.—The disease is almost always observed in women. Fehling has even asserted that it never occurs in men. Though most authorities state that it does not attack childhood, it has been observed as early as the fifteenth year (Siegert, *Münch. med. Woch.*, Nov. 1, '98). It is usually ascribed to defective osseous nutrition, through disorder of the trophic nerves, to deficiency of lactic acid, and to disease of the genital apparatus; but none of these may be said to have been positively demonstrated.

Pathology.—The morbid anatomical changes observed in osteomalacia are not always the same. In some cases bone-absorption is the chief element, in others the disappearance of earthy salts; but decalcification appears to be the earlier process, and it is only later that the organic portions are absorbed. In the long bones the medullary cavity is found enlarged, and the whole bone more cancellous; and as the disease advances the periosteum is stripped off, and a number of openings are seen, from which a clear fluid exudes. Fehling regards increased vascularity and friability of the ovaries as characteristic of the disease; and a hyaline degeneration of the arteries has been observed. Winckel and Kleinwachter deny that these changes are characteristic. (Ritchie.)

Treatment.—Phosphorus, which is of no particular value in rickets, is sometimes very effective in this disease. The most successful method is that of Kas-

minski, who gives it with codliver-oil. He first gives two teaspoonfuls a day of a mixture containing $\frac{1}{3}$ grain of phosphorus and 3 ounces of codliver-oil. He then gradually increases the daily dose until 6 teaspoonfuls are taken daily, the patient being closely watched. The mouth must be kept scrupulously clean. The treatment lasts from four to fourteen months.

Another method tending to favorably influence the disease is removal of the ovaries, as proposed by Fehling. This has frequently been followed by success.

Literature of '96-'97-'98.

In osteomalacia non-pregnant cases do well with the administration of phosphorus and the use of saline baths. If a faithful trial of these measures is without result, removal of the ovaries is indicated. Pregnant cases often do well with the bath and phosphorus treatment. When important changes in the pelvis are threatened, pregnancy should be interrupted. Should Cæsa-rean operation be performed, the uterus, tubes, and ovaries should be removed. Stieda (*Monats. f. Geburts. u. Gynäk.*, B. 8, H. 1, '98).

When removal of the ovaries and uterus cannot be carried out, pregnancy should be avoided, since child-bearing tends greatly to aggravate the disease.

Among the less effective—though valuable—methods are long-continued warm baths, salt baths, bone-marrow, and chloroform,—though the last has hardly been sufficiently tried to merit confidence.

Fragilitas Ossium.

The term "fragilitas ossium" is attributed to abnormal brittleness of the bones, due mainly to rarefaction, and predisposing the sufferer to fractures under the influence of slight traumatism, falls, and occasionally without as-

signable cause. Successive fractures of many bones may thus occur; but, rapid recovery ensuing, the only result is gradually-increasing deformity of the patient as a whole and the gradual loss of ambulatory powers.

ETIOLOGY.—In the majority of cases fragilitas ossium is an inherited dyscrasia, the origin of which is still unknown. It is at times associated with malignant growths, syphilis, rickets, general paralysis, locomotor ataxia, and after injuries involving lowered nutrition of the bony structures through long confinement in bed.

TREATMENT.—Once recognized, prophylactic measures calculated to avoid traumatism and other fracture-causing factors are alone indicated.

Bone Tuberculosis.

This name is applied to a chronic tuberculous inflammation of the osseous structures, which may be diffuse or local, superficial or deep. Superficial bone tuberculosis is termed *caries* by some authors: a term which formerly was attributed to what was thought to be a special form of necrosis.

Symptoms.—Pain in the affected region, stiffness of the overlying muscles and of the nearest joint, localized tenderness to pressure, and slight increase of local temperature constitute the first series of symptoms observed. The pain is deep-seated, but not sharp; the tissues may feel boggy and are sometimes slightly tumefied, owing to interference with the circulation, as indicated by the enlargement of superficial veins occasionally observed. As long as the inflammatory process is in its incipency, the general health does not suffer. As soon as the bone-tissues begin to disintegrate, however, and pus and tubercular deposits are formed, and caseation occurs, the local manifestations become

decidedly more marked and constitutional symptoms appear: those of distinct pyæmia of slow development. The pain is much greater; pus-channels and fistulæ are formed. When the purulent products are evacuated through the latter, however, the general health becomes improved. The fact that the disease may be arrested by removing the purulent foci indicates the pathogenic influence upon the general organism. The vertebrae, the upper end of the femur, the bones of the hands and feet, and the elbows are the regions most frequently involved. Under **SPINE, DISEASES OF; HIP-JOINT DISEASE; and JOINTS, DISEASES OF**, this important subject is fully treated respecting the parts named. The *spina ventosa* of the fingers is a tubercular disorder.

In some cases the characteristic symptoms are totally absent, even though the disease is steadily advancing; indeed, months often elapse before the tumefaction is sufficiently large to attract attention.

Tubercular foci in bones, when no sequestra are formed, may heal spontaneously, but in the presence of such the parts never undergo resolution. Of 314 cases studied by Riedel (Centralb. f. Chir., Feb. 18, '93), nearly 46 per cent. were devoid of sequestra. These may be discovered by means of the probe through a fistulous opening. The prognosis depends upon the ease with which operative proceedings can be resorted to.

Diagnosis.—The slight general manifestations, especially the unimportant temperature changes; the local enlargement, which in the case of fingers is sometimes very great before actual suffering is induced; coupled with the family history of tuberculosis, usually facilitate recognition of the true nature of the affection.

Etiology and Pathology.—Heredity is an important feature of these cases, tuberculosis being usually traceable several generations back. In many cases of bone tuberculosis the lungs are primarily affected: a source of direct infection. Tubercular foci may form in any part of the bone, but particularly in the spongy portion. At first limited to the size of a pea, perhaps, it gradually enlarges; circuitous foci are then formed, which coalesce. Several general foci of infection may thus be formed, all containing the bacillus of tuberculosis. The *detritus* may become transformed into a cheesy or liquid mass; if this does not occur, a sequestrum is formed, which sooner or later becomes free in the cavity, surrounded by caseous pus. Nature tries to remedy the defect present by inclosing the cavity in sclerotic bone-tissue, and an ivory-like envelope may thus be formed around the tubercular cavity. In other cases a limiting pyogenic membrane is generated. Fistulous ulcers are developed from these cavities, the pus breaking its way outwardly.

Treatment.—In the early stages symptomatic treatment is indicated, the limb being immobilized in such a manner, however, as not to interfere with outdoor exercise whenever possible. Indeed, fresh air is an important therapeutic factor in all these cases, as is also nutritious food and other means calculated to strengthen the patient's general powers. The sea-shore, the mountains, and pine-forests are very beneficial—as instanced by Arcachon in France. Local treatment is sometimes very effective. The best of these consists of injections with a syringe into diseased areas of a 10-per-cent. solution of iodoform in oil, sterilized by heating to the boiling-point. But each agent should be sterilized sep-

arately; in this manner the toxic effects of the iodoform are avoided. Betanaphthol, 1 part; camphor, 3 parts; when finely powdered and mixed, form an oily liquid which may be dissolved in ether, chloroform, and fats; Reboul has used this remedy in various strengths in tuberculous cavities, with signal success. Some surgeons favor ignipuncture with galvanocautery or thermocautery.

Operative measures consist mainly in exposing the affected area of bone and the use of the curette. This must be done thoroughly, however, every vestige of diseased bone or its contents being carefully removed. One small focus may serve for the development anew of all the symptoms. The same radical measures should be used in adjoining cavities or surfaces; no tuberculous centre should remain. The cavity should then be filled with iodoform-oil. Amputation used to be frequently resorted to in such cases; modern antiseptic methods have modified this tendency, and very few cases nowadays cannot be satisfactorily treated. Koch's tuberculin has been used with success by some, while others have reached opposite results with it. The measures indicated above are greatly to be preferred, and offer better chances of recovery.

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OVARIES. See UTERINE ADNEXA.

OXALIC ACID.—Oxalic acid is a caustic and corrosive poison obtained from cellulose. It occurs as transparent monoclinic crystals (resembling Epsom salts), having a strong acid taste. It is soluble in water and in alcohol, and slowly soluble in ether. Of all the irri-

tant vegetable poisons, oxalic acid is the most important. As it resembles Epsom salts (magnesium sulphate), it may be readily mistaken for it, and as it may be easily procured either as oxalic acid or as salt of sorrel or essential salt of lemon (potassium binoxalate) to remove ink-stains or iron-rust, to scour metals, to clean wood, or for use in photography, it is not infrequently taken by accident or with suicidal intent. Common sorrel (*oxalis acetosella*), containing oxalic acid in combination with potash (potassium binoxalate), is sometimes used in infusion as a cooling drink or as an ingredient of salads; but such use is not to be commended, as danger lurks therein. A fatal case of poisoning by the use of sorrel has been reported (*Hosp. Gaz.*, June, '86).

Oxalate of cerium is the only official preparation of oxalic acid; its description will be found under CERIUM.

Poisoning by Oxalic Acid.—When oxalic acid in substance or in strong solution is swallowed there is felt a hot, burning, acid taste during its passage downward, followed by pallor, clammy perspiration, violent prostration, intense abdominal pain, usually with vomiting. If the poison be diluted, the vomiting may last a long while. In some cases, however, vomiting is absent; in others it is incessant until death.

The mucous membrane of the mouth, tongue, and throat is whitened, appearing as though it were bleached. The nervous system appears to be also remotely affected, as, in cases of recovery from oxalic-acid poisoning, spasmodic twitchings of the facial muscles, temporary loss of voice, numbness, and tingling of the legs have been observed (Henry C. Chapman). It generally does its work quickly and the corrosive symptoms are replaced by those of fatal col-

lapse. When diluted sufficiently, so as to show no corrosive action, the acid is still highly poisonous, acting as a paralyzer of the heart (Foster). The minimum fatal dose, according to Taylor, is one drachm. Death may take place very quickly or may be delayed for several days.

Literature of '96-'97-'98.

Post-mortem examination of case of oxalic poisoning shows œsophagus and duodenum to be parts most affected; the stomach is much less implicated; the œsophagus is corroded in its whole length, the duodenum in places. The corrosions are white or dirty gray, opaque, or bile-stained or brown, from hæmatin; they are confined to the mucosa. The epithelium lining the stomach is abnormally transparent, with evidence of venous congestion; hæmorrhages into or on to the surface of the mucosa are of frequent occurrence. Precipitates of crystals or amorphous granules of oxalate of lime from white or milky patches on the mucous membrane. Kidneys are hyperæmic, and show cloudy swelling and deposits of crystals of oxalates in the contorted and straight tubules. Like the mineral acids, coagulation of the blood is produced, but as the blood-casts in the submucous vessels of the œsophagus and stomach always contain crystals of oxalate of lime, diagnosis is easy. Hans Reichold (*Friedr. Bl. f. ger. Med.*, vol. xlviii, pts. 3 and 4, '97).

Treatment of Poisoning by Oxalic Acid.—To be efficacious, the treatment should be prompt and assiduous. After evacuating the stomach by emetics and siphon or stomach-pump, chalk (calcium carbonate), magnesia, and plaster-scrapings from the wall should be given, well stirred in water. Alkalies and their carbonates should not be given, however, under any circumstances, as the salts formed would be as poisonous as the oxalic acid.

Literature of '96-'97-'98.

Case of oxalic-acid poisoning in a boy, aged 15 years. Seen 12 minutes after the poison had been swallowed, patient was unconscious, markedly pallid and clammy, and extremities cold. Radial pulse could not be felt. Pupils were fairly dilated. Jaw was fixed in tetanic spasm, and froth exuded from between the teeth.

One-tenth grain of apomorphine was injected hypodermically; a stomach siphon-tube was introduced after the jaws had been pressed apart, and a pint of warm water was placed in the stomach, but immediately expelled. Vomiting continued, and consciousness returned. The boy now was given $\frac{1}{2}$ ounce of powdered chalk, suspended in water, and this also was shortly ejected. Recovery proceeded under stimulation. The quantity of poison taken was upward of $2\frac{1}{2}$ drachms. F. J. Lorimer Hart (Lancet, Oct. 1, '98).

Therapeutics.—Poulet proposed the use of this drug in asthma, capillary bronchitis, and tuberculous bronchitis. In some cases where oxalic acid was given in $\frac{1}{2}$ -grain doses F. W. Talley observed that it caused nausea, gastralgia, and an eruption resembling urticaria. Talbot Jones has reported four cases in which acute articular rheumatism was apparently produced by prolonged contact with a solution containing oxalic acid.

Generally speaking, however, oxalic acid is more interesting on account of its effects as a toxic agent than as a remedial one.

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OXALURIA.

Definition.—Although, logically, the term oxaluria ought to be limited to an abnormal condition of the urine characterized by the presence of an increased amount of oxalic acid, ordinarily it is

employed to signify the precipitation of a sediment of oxalate of lime by the urine, caused commonly by diminution of the acid phosphates and compatible even with very small percentages of oxalic acid in the urine.

Normally about 0.02 gramme of oxalic acid is excreted daily, but, as the oxalic acid contained in the aliments easily passes in the urine, that amount may easily be increased by the ingestion of sorrel, spinach, etc. The crystals of oxalate of lime are pellucid octæders, soluble in muriatic acid, but not in acetic acid.

Etiology and Pathology.—The formation of a sediment of oxalate being held by many authors to be the result of abnormal metabolism, it was believed to be intimately connected with many symptoms of disease, especially of the nervous system. Prout, Golding-Bird, and Cantani mentioned as the symptoms of oxaluria general weakness, restlessness, headache, pain in the spine and in the abdomen, painful micturition, diminished sexual power, hypochondria, melancholia, etc. Later investigations have proved that the precipitation of oxalate may be compatible with perfect health, although it is often observed in disorders of the nervous system, of which it can, nevertheless, not be considered to be the cause. The only danger arising from the sedimentation of oxalate is that it may give rise to a calculus, and sometimes the presence of minute calculi will reveal itself by painful micturition.

Literature of '96-'97-'98-'99.

From a study of cases of oxaluria following deductions are made: 1. Whereas the appearance of oxalates in the urine—excluding their ingestion in foods—is due to a derangement of digestion or metabolism, this derangement probably has its cause in many cases in functional nervous irregularity, which may or may

not be so great as to produce general nervous symptoms; and, if these are present, they are not necessarily caused by the oxalates. 2. The condition causing the appearance of oxalates in the urine may produce symptoms closely simulating the constitutional symptoms of Bright's disease. 3. The excretion of oxalates by the kidney for a short while may occasion no local disturbance of that organ, but if continued may, by irritation, cause the appearance of albumin and casts with lessened urine, corresponding to the urinary symptoms of Bright's disease, and, if unchecked, may lead to permanent destruction of kidney-tissue and to true Bright's disease. 4. In all suspicious cases in which the nephritic symptoms are accompanied by the appearance of oxalates in quantity, diagnosis should be held in abeyance and the oxaluria be overcome by appropriate remedies to exclude this as a possible cause of the symptoms before making a positive diagnosis and pronouncing a necessarily hope-dispelling prognosis. R. F. Williams (Med. Register, Apr. 15, '99).

Treatment.—The treatment consists in the prohibition of such aliments as contain large quantities of oxalic acid (sorrel, spinach, rhubarb), in recommending a proper diet containing a fair portion of meat and thus augmenting the acidity of the urine, and in prescribing alkaline spring-waters in moderate doses in order to saturate the excessive acidity of the gastric juice often corresponding to a diminished acidity of the urine, and to dilute the urine and dissolve the salts contained in it.

The ingestion of easily-digested nitrogenous food, similar to the diabetic regimen, limited to strict rules of diet, has been found to yield the best results in the treatment of oxaluria. Neidert Münch. med. Woch., Aug. 26, '90).

In treatment of oxaluria permanganate of potash in dose of a teaspoonful of a solution of 8 grains in 2 ounces of water, to be given thrice daily, recommended. It should be given on an empty

stomach, as it readily gives up its oxygen to whatever it comes in contact with. Norris (Mass. Med. Jour., May, '91).

Literature of '96-'97-'98.

Oxaluria associated with functional disturbances of the stomach. An exclusive diet of meat causes it to disappear completely. The cause is probably the action of some toxin. De Dominicis (Wiener med. Woch., Apr. 25, '96).

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OX-GALL.—Ox-gall, *fel bovis* (U. S. P.), or *fel tauri* is the fresh bile of the ox (*Bos taurus*). It is green, or brownish-green, viscid liquid of disagreeable odor and bitter, nauseous taste. Crude ox-gall is not employed in medicine. Inspissated ox-gall occurs as a yellowish-green, thick extract of unpleasant odor and disagreeable bitter taste. Purified ox-gall (sodium choleate) occurs as a yellowish-white powder, which attracts moisture readily.

Doses and Preparations.—*Fel bovis* (crude ox-gall).

Fel bovis purificatum (purified ox-gall), 3 to 10 grains.

Therapeutics.—Ox-gall is used in habitual constipation, combined with other appropriate remedies, in intestinal dyspepsia, and in malnutrition from an inability to digest fats. It has been given in typhoid fever, when there is a deficient secretion of bile. In enema it has been found useful as a solvent of hardened faecal masses in cases of faecal impaction.

Harley recommends ox-gall in 5-grain doses, in capsules, in jaundice.

Ox-gall has been used to expel lumbricoid worms.

OXYGEN.—Oxygen was discovered in 1774 by Scheele, in Sweden, and Priestley, in England, independently of each

other, and described under the names of "empyrean air" and "dephlogisticated air." The name oxygen was given to it by Lavoisier some time afterward. In the atmosphere oxygen exists in a free and uncombined state (20 to 23 per cent.) mixed with nitrogen. Oxygen-gas is tasteless, colorless, and odorless. It is heavier than air and eight times heavier than hydrogen. When liquefied under pressure, it has a bright, sky-blue color. Water is a combination of oxygen (8 parts) and hydrogen (1 part). Under certain conditions it appears under the allotropic forms of ozone and autozone.

Preparations.—For experimental purposes oxygen may be obtained by mixing finely-powdered black manganese oxide (1 part) and potassium chlorate (4 or 5 parts), heating the mixture in a flask or retort, and receiving the gas in an inverted jar over water. All the oxygen comes from the chlorate, the manganese remaining quite unaltered. Although the process is very simple, certain precautions should be observed if the gas be intended for inhalation. The manganese oxide should not contain any combustible matter, or an explosion will result; a small portion should be first heated in a metal cup, should there be any doubt of the purity of the manganese. The first portions of gas should be allowed to escape, as they are contaminated by the atmospheric air of the apparatus and a little chlorine. The gas as evolved should be passed through three or four wash-bottles containing water, and to the first of these should be added about $\frac{1}{2}$ per cent. of caustic potash (to absorb any free acid), to the second about $\frac{1}{2}$ per cent. of silver nitrate (to absorb any free chlorine). The last washings should be with pure water. The gas may then be collected in a suitable gasometer and kept for a short time,

or in rubber bags if wanted for instant use. Oxygen is now made on a larger scale, commercially, directly from atmospheric air, and is sold at a very low rate, delivered in steel cylinders, generally compressed so that a cylinder containing one hundred to two hundred gallons is of a convenient size for handling. From these cylinders the gas is drawn off into a gasometer or rubber bag, for office use or for single administration.

Therapeutics.—Oxygen—whose physiological action is too well known to warrant repetition—may be administered in medicine or surgical practice in various ways: by inhalation, either pure, mixed with atmospheric air, nitrous oxide, ether, chloroform, or other substance; by drinking oxygen-water; by local application of a stream of gas or in solution as oxygen-water, hydrogen dioxide, etc.

USES BY INHALATION.—Inhalations of oxygen-gas are, in a general way, indicated in conditions where there is a deficiency of oxygen, manifested by symptoms of asphyxia, dyspnoea, or disturbed nutrition, or when there is some functional disturbance of or impediment to respiration.

We find inhalations of oxygen useful and curative in the second and third stages of pneumonia when there is present a deficient aëration of blood (cyanosis and dyspnoea), with consequent heart-distension. The pure gas may be used, but better results are obtained by diluting it with 10 per cent. of nitrous oxide. The inhalations may be applied at intervals as required, or it may be necessary to keep them up continuously until all danger is passed.

Case in which inhalations kept up for 106 hours without intermission. At the end of that time breathing easy and natural, and complete recovery followed.

Temperature fell during the long-continued inhalation; the average amount of gas inhaled in each 24 hours being 200 gallons of oxygen-gas diluted with 10 per cent. of nitrous oxide. Blodgett (Boston Med. and Surg. Jour., No. 21, '90).

Oxygen inhalations are also beneficial in advanced bronchitis, especially in old persons. In stenosis of the larynx, croup, diphtheria, emphysema, heart disease, and in œdema, or marked congestion of the lungs the dyspnœa is greatly relieved by oxygen inhalations. In cardiac asthma it has been shown that the condition of the heart-muscle and the aorta is of an active or predisposing cause. If the organic lesion be overlooked, and a good prognosis given, surprise may be occasioned by the sudden death of the patient from heart-failure. The accentuation of the second aortic sound is the most reliable sign. The dyspnœa and cyanosis of cardiac insufficiency, Heitler says, may be promptly relieved by the combined use of morphine and ether hypodermically, with inhalations of oxygen.

Catlin recommends oxygen as the remedy for profound shock, either from hæmorrhage or nervous strain. He has used it successfully in hæmorrhage at the sixth month of pregnancy followed by miscarriage, where the prostration was absolute, with shock and constant vomiting. He has also found oxygen inhalations of benefit in typhoid fever where the prostration was marked.

Oxygen inhalations are useful in the resuscitation of persons asphyxiated by coal-gas, sewer-gas, hydrogen sulphide, carbonic oxide and dioxide, and chloroform-vapor.

In simple anæmia and chlorosis, in pernicious anæmia, and also in leukæmia oxygen inhalations have been followed by great improvement.

As a stimulant inhalation and as a nervous sedative, inhalations of oxygen-gas (60 parts) mixed with nitrous-oxide gas (40 parts) are highly recommended.

The combination of oxygen-gas with nitrous oxide or with the vapors of ether or chloroform has been used for the purpose of overcoming the disadvantages of the latter remedies. Oxygen decreases the danger and obviates the untoward effects. When oxygen is used in combination with ether for general anæsthesia, we observed less vomiting, less pallor, and less post-operative depression. F. H. Markoe states that if anæsthesia be induced by oxygenated nitrous oxide, it can be most satisfactorily and safely prolonged with oxygenated ether (Annals of Surg., Feb., '96). Robert Abbe concurs in the opinion of Markoe, and remarks that there is no question of a gain of oxidation during etherization by the combined use of oxygen and ether. The patient's complexion is pinker, the blood in the wound more arterial, the minute arteries seem to spurt more, but the blood clots quickly, so that there is no greater hæmorrhage.

Literature of '96-'97-'98.

Having observed the practice of Dr. Landau, of Berlin, who has his patients inhale pure oxygen after the ether has been withdrawn, one should be convinced that the practice is a most useful and valuable one. The immediate effects of inhaling oxygen are: the dusky hue of the face disappears, and the pulse becomes fuller and slower; there is also a more rapid recovery of consciousness and freedom from vomiting and pain. T. Parvin (Med. and Surg. Reporter, Apr. 4, '96).

Conclusions as follows in regard to use of oxygen in connection with an anæsthetic: The longest term required to produce complete anæsthesia with ether and oxygen-gas (diluted) was 14 minutes; the shortest time with the same anæsthetic, 7 minutes. With pure

oxygen, anæsthesia with ether requires from 20 to 25 minutes, and then it will sometimes require the giving of ether with a cone and dispensing with the oxygen-gas for 2 or 3 minutes. With chloroform and oxygen-gas (diluted) the results are far more satisfactory and anæsthetization is very rapid, usually requiring about 2 or 3 minutes. I. N. de Hart (Boston Med. and Surg. Jour., Apr. 16, '96).

INTERNAL ADMINISTRATION.—Oxygen-water is made by charging cold distilled water with oxygen-gas under pressure. It is bottled in siphons (preferably) or other strong bottles, under a pressure of 150 to 200 pounds. When wanted for use it is drawn off by pressure from the siphon-lever, or if in bottles by means of a champagne-tap. A little nitrous-oxide gas, added to the water during the process of bottling, adds piquancy and increases its stimulating effects.

The use of oxygen-water is advised in chronic dyspepsia, and in headaches of digestive or neuralgic origin.

Constipation due to intestinal atony is relieved by draughts of oxygen-water, swallowed quickly.

In general systemic torpor 1 or 2 tumblerfuls of oxygen-water after meals will prove beneficial.

LOCAL USES.—Stoker (Med. Press and Circ., April 17, '95) describes the local treatment of ulcers and wounds by the direct application of oxygen-gas. For this purpose he states that the oxygen may be diluted with pure air according to the requirements of each case. It is not necessary that an absolute vacuum over the parts treated should be produced. An oral rubber receptacle or cup covers the part to be treated and the gas is supplied to it from a rubber bag by means of tubing. Pure oxygen causes a great deal of pain, but some patients can stand it well.

Literature of '96-'97-'98.

Attention called to the triple property possessed by oxygenated water of hastening the precipitation of fibrin, of exciting the smooth fibres, and of injuring the tissues but slightly or not at all. For these reasons it must be an excellent hæmostatic for external use. If, in a case of intra-uterine hæmorrhage due to fungous metritis or to interstitial fibroid, a tent covered with cotton dipped in oxygenated water at 12 volumes be introduced into the fundus, an abundant moss will be seen to form, becoming confluent at the external orifice, while the organ contracts on the tent and the hæmorrhage is immediately arrested. There is no pain nor modification of tissues, and the hæmostasis persists long enough to enable the anæmic patient to recover strength and to support a radical operation later on if necessary. Paul Petit (Lyon Méd., Jan. 5, '96).

For the local uses of oxygen in solution see HYDROGEN DIOXIDE.

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OZONE.—There has always been considerable discussion concerning the nature of ozone, but the consensus of opinion is that it is an allotropic or modified form of oxygen. It was discovered in 1839 by Schönbein, of Basle, who noticed that dry oxygen, or atmospheric air, when exposed to the action of a series of electric sparks, emitted a peculiar and somewhat metallic odor, resembling that of phosphorus, chlorine, or sulphur. This odorous principle (electrified oxygen) he called ozone.

Ozone is a colorless gas, having a characteristic odor. It is insoluble in water (pure water will absorb about 8.81 per cent. of ozone, the larger part, however, being converted by the water into oxygen without the formation of hydrogen dioxide) and in solutions of acids or alkalis, but is absorbed by a solution of

potassium iodide. It is soluble in oils, some of them taking up as much as 25 volumes per cent. It exerts an irritating action on the lungs when present in any great amount in the air. Ozone is decomposed into oxygen by heat, gradually at 212° F., and instantly at 554° F. with an increase of 50 per cent. in volume.

It is a powerful oxidizing agent, and possesses strong bleaching and disinfecting properties. It corrodes cork, rubber, and other organic substances, and rapidly oxidizes iron, copper, and even silver, when moist, as well as dry mercury and iodine. The absorption of ozone by these and other agents is not attended with any diminution of volume. Oxygen when ozonized diminishes in volume (in the proportion of 3 to 2, according to Sorét); when the ozone is decomposed by a metal or other substance, one-third of it enters into combination, while the remaining two-thirds, which is set free as ordinary oxygen, occupies the same bulk as the ozone itself. Ozone may be liquefied by cold and pressure (125 atmospheres), and in that state it has an intense-blue color. Liquid ozone boils at 222.8° to 286.2° F., and if inclosed in a glass tube changes to a blue gas, which again reverts to the liquid state upon being cooled.

Preparation and Distribution.—Ozone exists naturally, in moderate and variable quantities, in atmospheric air. It is formed during thunder-storms and by silent electrical discharges in the atmosphere. It is evolved during the process of evaporation of water, especially of salt water, and also a result of the respiration of plants, especially those belonging to the *Conifere*. It is therefore found in Nature at the sea-shore; in forests, especially in the pine-woods; at the summits of mountains and of high towers. On the other hand, it is usually absent in

crowded cities and where organic matter is undergoing slow oxidation, except after a thunder-storm. A great amount of ozone is formed in the mist rising from the cold ground, under a clear sky, on a calm autumn or winter day. Atmospheric ozone, according to Schönbein, is only generated in any considerable quantity when oxygen, moisture, and sunbeams combine, as exemplified and utilized in the bleaching of linens upon the lawn. According to the same authority, under the influence of light the green foliage of plants exhale both ozone and neutral oxygen, both of which are again taken up in part by the growing cells of the plant.

Ozone may be prepared artificially by oxidizing phosphorus in moist air; by the electrolytic decomposition of water; by the slow oxidation of ether, oil of turpentine, and other essential oils; and by the action of strong sulphuric acid upon a mixture of potassium permanganate and oxalic acid; and also, as shown by A. Houzeau, by the action of strong sulphuric acid upon barium dioxide; and by subjecting a current of oxygen to the action of the static electrical current.

Although the production of ozone by means of static electricity was discovered in 1839, it was not until 1854 that ozone was obtained in any appreciable quantities by von Siemens. Andrews and Tait discovered that the silent electrical discharge between very fine points would yield the maximum of ozone; and that the intermittent discharge, accompanied by the emission of sparks, caused a considerable amount of ozone produced to be reconverted into ordinary oxygen as fast as it was formed. Von Siemens's apparatus consisted of a sort of Leyden jar, made by coating the interior of a long tube with tin-foil, and passing over this tube a second wider tube coated with

tin-foil on its outer surfaces. Between the two tubes a current of dry oxygen is passed, which becomes electrified by induction, on connecting the inner and outer coating with the terminal wires of an induction-coil (Ruhmkorff coil) or with a Holtz static machine. By this means it is said that from 10 to 15 per cent. of the oxygen may be converted into ozone. Von Siemens and Halske have since improved the original apparatus in many ways.

Houzeau's apparatus consists of a glass tube containing within a stout platinum filament, and wrapped on the outside with a spiral of copper wire or other good conducting material. One of the rheophores of the induction-coil is connected with the platinum wire, the other with the copper spiral. A current of dry oxygen-gas is allowed to pass through the tube.

The quantity of ozone produced is increased by lowering the temperature, about 50 per cent. of the oxygen being converted into ozone at -88° F. Based upon this principle, W. J. Morton devised an effective machine which is much improved in detail (*N. Y. Med. Jour.*, June 23, 30, '94), the output of the machine being measured in milligrammes of ozone per minute, and the dosage regulated accordingly.

Tests for Ozone.—In the presence of potassium iodide and moisture ozone will cause the liberation of free iodine (one-third of its volume acting in this liberation and two-thirds escaping as oxygen). Based upon this, test-papers are prepared by immersing sheets of unsized (bibulous) paper into a solution of starch and potassium iodide; these sheets are dried and afterward cut into strips of convenient size. For use one of the strips is moistened and exposed; if ozone be present in the air, it will liberate free iodine,

which in turn will act upon the starch, producing a blue color (iodide of starch).

Bibulous paper dipped into tincture of guaiac will turn blue upon exposure to ozone.

Moistened indigo test-papers are decolorized by ozone.

In applying these tests it should be remembered that most of the reagents react similarly to hydrogen dioxide and to ozone, and allowances should be made therefor.

Physiological Action.—The air contains about two parts of ozone in one million: a quantity thought sufficient to act as a stimulant to the respiratory tract. To the absence of ozone in the air has been attributed many ailments, especially neuroses such as hay fever and the "nervousness" of which women most frequently complain. The fact that such disorders seem to be improved after a thunder-storm has apparently sanctioned this view and led to the use of ozone as a remedy. In concentrated form it causes, when inhaled, inflammation of the respiratory tract and coagulation of the blood in the superficial arteries, though it restores the fluidity of the blood outside of the body. The local effect is attributed to its destructive influence upon the epithelium of the respiratory tract and inhibition of its functions, besides interference with the discharge of carbon dioxide. The toxic effects thus brought about unfavorably affect general metabolism and cause depression of cardiac action.

Physiological action of the ozone preparations studied in a series of experiments on dogs. 1. When injected in the circulation in full strength,—i.e., 15 volumes per cent.,—they have a very destructive action upon the blood, thereby ultimately having the effect of reducing rather than of oxidizing agents for the tissues. 2. Acting through the

stomach or intestine, they may similarly affect the blood, and in addition they destroy the gastric and intestinal mucous membrane. 3. Given in medicinal doses by the stomach, their only benefit, if any, consists purely in their local action in the alimentary canal, in possibly preventing abnormal fermentations. 4. If so used, care should be exercised, owing to the great variability in strength of different preparations. 5. Ozone is of no real value to the tissues, whether inhaled or drunk in fluid preparations, and it may be exceedingly harmful. W. G. Thompson (*Med. Rec.*, Mar., '94).

Therapeutics. — Ozone is utilized in medicine and surgery in the forms of ozonized air obtained through the use of one of the various special electrical apparatuses or as furnished by Nature at the sea-shore, mountains, or in the pines; ozonized (?) water, prepared by charging distilled, sterilized water with ozone by means of special apparatus; or ozonized oil: oil saturated by passing ozone or ozonized oxygen through it.

Ozone is thought to be Nature's purifier, acting by active oxidation upon decaying, putrescent organic matters, and converting them into harmless products, such as nitrous and nitric acids, water, hydrogen dioxide, and carbon dioxide; but its chief value in medicine is derived from its deodorizing and disinfecting powers.

In diphtheria, croup, pertussis, variola, scarlet fever, cholera, and other infectious diseases ozone generated in the room is said to improve the condition of the patient and minimize the contagion. Vapors of turpentine, eucalyptus, and similar substances will furnish a certain amount of ozone. Ozone disinfection of rooms after occupancy by subjects having contagious diseases is, perhaps, more effectual than by other methods.

Ozone, as a disinfectant, is without value, as, before the proper degree of

saturation is obtained, the air ceases to be respirable. J. de Christmas (*Ann. de l'Inst. Pasteur*, Nov., '93).

Inhalations of ozonized air have been used with good effects in diphtheria (Caillé, *Archives of Pediatrics*, Aug., '92), in cholera, chronic rhinitis, bronchitis, asthma, and emphysema.

Caillé urges the use of ozone inhalations in the early stages of phthisis; Ransome advises ozonized-oxygen (9 per cent.) inhalations in the later stages, as they appear to improve the appetite, increase the sleeping powers, and produce a gain in weight.

In cases of cachexia, anæmia, and malnutrition inhalations of ozonized air have been found beneficial. H. S. Norris, of New York, observed improvement in cases of phthisis, following the use of ozonized water, taken internally. Schmidt reports excellent results following parenchymatous injections of ozonized water in two cases of epithelioma. He considers that it may be useful also in sarcoma and tuberculous growths. He reports the successful use of ozone-water as a local application in diphtheria.

Schnee, of Carlsbad, claims great benefit from the use of ozone-water in functional diabetes. Dührssen, of Berlin, also obtained good results in cystitis from the use of injections of ozone-water.

W. J. Morton and C. C. Rice, of New York, have employed ozone-gas locally in cases of atrophic rhinitis and pharyngitis sicca (the patient holding the breath after taking a deep inspiration) by allowing a current of ozonized air to pass into the nostrils through a tube, intermittently. Rice has used ozonized sweet oil (8.75 volumes per cent.) in ozæna; it thoroughly deodorized the nostrils.

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P

PALATE, DEFORMITIES OF. See PLASTIC SURGERY.

PALPEBRÆ, DISEASES OF THE.

Inflammation of the Eyelids. (See BLEPHARITIS, volume i.)

Injuries of the Eyelids.

The lids may be the seat of all kinds of injuries, and, on account of the looseness of the skin over the overlying tissues, œdema and ecchymosis are usually present.

Abscesses of the lid give rise to a localized red swelling, associated with more or less œdema and hyperæmia of the entire lid and the conjunctiva lining it. Throbbing pain in the eye and head and some fever accompany its formation. Abscess of the lid is usually the result of traumatism, but may be secondary to periostitis or caries of the margin of the orbit.

TREATMENT.—If there be a solution in the continuity of the lid, the edges of the wound should be carefully approximated with sutures and evaporating lotions, like dilute lead-water and laudanum, should be applied. Simple ecchymosis of the lids, usually designated as “black eye,” should be treated with ice-compresses and lead-water and laudanum. When an abscess is present, hot fomentations are useful until fluctuation is detected. An incision should then be made into the abscess parallel to the muscle-fibres.

Literature of '96-'97-'98.

In contusions of the lids, if patient is seen early, treatment consists of cold compresses or cooling or evaporating lotions. If patient is seen later hot compresses and massage are indicated to hasten the disappearance of the discoloration. Cold compresses are to be applied continuously at first, but not by

means of an ice-bag or a piece of ice wrapped in a handkerchief and applied directly to the swollen lids. Small compresses of lint or flannel, fourfold or sixfold, measuring one and one and one-half inches in diameter, are to be cooled upon a block of ice and then transferred to the lids. An exchange is made between the warm one on the lids and a cool one from the ice every minute or two. Care should be taken not to allow the cold compresses to cover the nose, since acute coryza may be caused. Cold compresses of this sort are to be applied during the first twenty-four hours, either continuously or every second or third hour for an hour at a time. The application of cooling and evaporating lotions are of service, though less potent than iced compresses. Such cooling lotions consist of:—

℞ Acidi borici, 2 drachms.

Spir. vini, 2 ounces.

Aquæ, q. s. ad 1 pint.

Or:—

℞ Tinct. arnicæ, 2 ounces.

Aquæ, q. s. ad 1 pint.

Both of these are to be applied cold, the compresses being wrung out of the boric acid or the arnica mixture and changed frequently. When the swelling has subsided and discoloration shows itself in a more pronounced manner, the lengthy duration of this stage can be cut short by hot applications and by massage. Flannel cloths are to be wrung out of hot water—as hot as can be borne—and allowed to lie upon the lids, being changed every minute or two; such applications are continued for an hour at a time, and applied three times a day, or oftener. When the skin is very sensitive, it is well to apply a little white vaselin or any variety of bland salve to the eyelids previous to the use of hot compresses, so as to prevent soreness and irritation of the skin. In using massage the area involved is smeared with the ointment of the yellow oxide of mercury or white vaselin, and then gentle massage is practiced for five or ten minutes at a time, or longer, several times a

day. If it is particularly desired to cause a very rapid disappearance of the blood-stain, the hot compresses may be used continuously, and the massage for a number of hours. By these means the disfigurement may be almost, if not entirely, removed within twenty-four hours, or even sooner, after the subsidence of the swelling. C. H. May (Med. Rec.; Brit. Med. Jour., Oct. 22, '98).

Hordeolum (Stye).—Hordeolum is a circumscribed purulent inflammation situated at the follicle of an eyelash. At first there is a hard swelling, with more or less involvement of the entire lid. A yellow head soon caps the little tumor, and, if allowed to go on, this will break open and the contents be discharged. There is usually a feeling of great tension in the lid until the abscess is opened, and there may be slight febrile disturbance.

Hordeolum is found chiefly in the young, especially in anæmic girls, where it is the expression of a constitutional disturbance. Habitual constipation has been assigned as a common source of the inflammation. Uncorrected ametropia is a frequent cause.

TREATMENT.—The inflammation may at times be aborted in the earliest stages by hot boric lotion, by massage with yellow oxide of mercury, by applications of silver nitrate, or by painting the swelling with collodion. If this fail, suppuration should be encouraged by hot applications, and a free incision be made as soon as pus is suspected. Sulphide of calcium internally is frequently of service.

Chalazion.—Chalazion is a hard swelling which forms in the lids in connection with a Meibomian gland. It varies in size from the head of a pin to a large pea. Suppuration may occur, and the viscid contents of the tumor be discharged on the conjunctival surface of the lid, or the

growth may be wholly absorbed and disappear. As a rule, it causes but little pain; rarely at times, however, it takes an acute form, when the symptoms resemble those of hordeolum. Chalazion originates in a chronic inflammatory process in the connective tissue surrounding a Meibomian gland, especially where there is uncorrected ametropia. It usually occurs in adults.

TREATMENT may be either abortive or radical. The former is rarely successful, but massage of the growth may be tried, using an ointment of yellow oxide of mercury or iodide of cadmium.

The radical plan consists in the removal of the growth by operation, either from the skin or conjunctival surfaces. If the tumor shows evidence of having broken down, it had better be removed from the latter surface. This is accomplished by means of a vertical incision into the growth with a sharp scalpel, after thorough cocaineization of the conjunctiva, and the removal of the contents of the sac with a small curette or scoop especially constructed for this purpose. If, on the other hand, the growth be large and firm, and gives no evidence of having undergone degeneration, it is better to remove it from the skin-surface by means of a formal dissection. For this purpose it is customary to control the hæmorrhage by means of a clamp which includes the field of operation in its area, and to insert several stitches after the tumor has been excised. Care should be taken that all of the growth be removed to prevent recurrence.

Literature of '96-'97-'98.

In the electrolytic treatment of chalazion, or Meibomian tumors, a current of 10 milliampères may be used, the electrode consisting of a fine depilatory-needle. F. H. Haussell (Phila. Polyclinic, June, '98).

Cutaneous Disorders of the Eyelids.

ECZEMA.—Eczema is one of the most frequent of palpebral affections; it is usually met with in children in its moist form (*crusta lactea*). It is generally secondary to phlyctenular conjunctivitis, and results from the continued irritation of the lids by the profuse lachrymation incident upon this form of conjunctivitis. A similar eruption is seen in adults, especially in the lower lid, when the lachrymation is secondary to lacrymal disease or catarrh of the conjunctiva.

Treatment.—Removal of the scabs with a warm solution of bicarbonate of potassium without provoking any bleeding is advisable. After the lids have been thoroughly dried, a solution of silver nitrate, 20 grains to the ounce, should be carefully applied to the raw surfaces. The lid should then be covered with an oxide-of-zinc ointment. Either the plain ointment may be employed or one consisting of equal parts of oxide of zinc and vaselin, to which 20 grains of calomel have been added.

HERPES-ZOSTER OPHTHALMICUS is an inflammatory affection of the skin, characterized by the formation of vesicles along the terminal expansions of the supra-orbital division of the fifth nerve, and sometimes its nasal branch, and more rarely the infra-orbital division of the same nerve as well. The vesicles are generally grouped together and have an inflamed base. At first they contain a limpid fluid, but this soon becomes clouded; the vesicles then dry up and form scabs, which fall off and leave deeply-pitted scars that persist during the remainder of life. As a rule, the appearance of the vesicles is preceded by severe neuralgic pain in the course of the affected nerve-branches, and there is some fever. The pain generally subsides with the efflorescence of the vesicles. The

eyeball is sometimes implicated, either in the form of a keratitis, iritis, or iridocyclitis. I have noted the occurrence of the disease with acute glaucoma.

It usually occurs in the old and feeble, although it has been seen in young and healthy individuals.

Treatment is wholly symptomatic, and consists in sedative local applications of lead-water and laudanum, or in dusting rice-starch over the affected areas. Morphine should be administered internally for the relief of pain, and tonics should be directed toward building up the system. For the severe neuralgia which frequently remains after the subsidence of the inflammation, croton-chloral hydrate, in doses from 5 to 10 grains every four hours, and the use of a mild galvanic current have been highly recommended. Any ocular involvement must be combated by the proper remedies.

Tumors of the Eyelids.

CARCINOMA of the eyelids takes the form of *rodent* or *Jacob's ulcer*, occurring in adults, and characterized by a slowly-progressive, but destructive, ulcerative process, by which the lids and the neighboring tissues are gradually consumed. The first appearance is that of a pimple, usually at the inner canthus, which becomes indurated and covered by a scab.

Treatment should consist in the early and complete removal of all the diseased tissue by dissection, followed in some cases by the application of chloride of zinc or even of the actual cautery.

XANTHELASMA.—Xanthelasma are yellowish or buff-colored *plaques*, which are occasionally found upon the eyelids. These patches are slightly raised above the surrounding skin, and are frequently semicircular in shape. They are often symmetrical, and have a predilection for the inner part of the upper lids. They are more common in women than in men,

and occur in adult life as a result of hypertrophy of the sebaceous glands, with subsequent fatty degeneration of the subcutaneous connective tissue.

Treatment.—As these growths have no significance other than a cosmetic one, they should not be interfered with, save when they are large and disfiguring, in which event they may be removed by careful dissection.

MOLLUSCUM CONTAGIOSUM.—This consists in a white tumor, varying in size from the head of a pin to that of a pea, that forms in the skin of the lid. The disease begins in a sebaceous gland, and is found chiefly among badly-nourished children.

PAPILLOMATA, SARCOMATA, AND EPITHELIOMATA are all found on the lids, but as they have no characteristics different from those which they possess in other localities, they do not require special mention.

Syphilis of the Eyelids.

Primary sores are found on the margin of the lids, usually at the canthi. The first appearance is that of a pimple, which gradually breaks down into a depressed ulcer, with a characteristic induration of the base. The glands in front of the ear and at the angle of the jaw are almost always involved, and the usual constitutional signs of syphilis follow. The contagion is carried to the eye, as a rule, by the finger, though in some instances it has followed a kiss or the filthy custom, practiced in some communities, of attempting to dislodge foreign bodies from the eye by the tongue.

Rarer forms which occur in the secondary and tertiary stage of the disease consist in a marked induration and swelling of the entire lid, followed by ulceration of the margins of the lids and the loss of the cilia.

TREATMENT.—Chancres should be

dusted with finely-powdered iodide of mercury, or application made to them by the black or yellow wash. General mercurial treatment should be employed as soon as the diagnosis of syphilis is assured.

Neuroses of the Eyelids.

BLEPHAROSPASM is an involuntary contraction of the orbicularis palpebrarum, and may be either the result of irritation of the ophthalmic division of the fifth nerve by reflex action, as in disease of the cornea, etc., or it may be an essential spasm, occurring in eyes that are perfectly normal. A slight twitching in a few fibres of the muscle is not unusual in ametropia and may be made to disappear by the adjustment of the proper glasses.

Literature of '96-'97-'98-'99.

Cases of blindness after phlyctenular spasm have occurred not infrequently. Laber suggested that they might be either reflex or the result of a forgetfulness of the use of the eyes. Hysteria does not appear to have been present in any case. Ordinarily, the children recover, learning to see exactly as does the newborn infant. The theory that they have forgotten the use of their eyes is, personally, not wholly accepted, it being believed that they avoid visual perception because previous to the palpebral spasm such visual perceptions were painful or at least unpleasant. Amaurosis following phlyctenular spasm is a disease that does not find a place in any of the classifications used to-day. It appears to be a purely functional condition, or at least an anatomical one, not recognizable as such. It should be regarded as a retrogression to an earlier stage of intellectual development. Baas (Münch. med. Woch., Jan. 24, '99).

Treatment should aim at the cause. In severe cases hypodermic injections of morphine into the lids may be necessary, or even subcutaneous division of the nerve.

In cases of obstinate blepharospasm stretching fibres of orbicularis muscle

resorted to preferably under an anæsthetic, by placing a strong, short speculum between the lids. Instrument is firmly set, and allowed to remain in position for about five minutes. If necessary, the procedure can be repeated several times at intervals of a few days. Allport (Amer. Jour. of Ophthal., Jan., '91).

Blepharospasm associated with conjunctival or corneal trouble successfully treated by introducing a speculum and opening its branches sufficiently to expose the cornea for five or ten minutes to diffuse daylight. Callan (Jour. Amer. Med. Assoc., Jan. 24, '91).

Ptosis is a drooping of the upper lid over the eyeball, with inability to raise the same. When not congenital, or the result of thickening of the lid from inflammation, it is due to paralysis of that branch of the third nerve which supplies the levator palpebræ superior. Ptosis is frequently associated with palsies of other muscles supplied by the third nerve, and when it is an isolated symptom suggests central disease.

TREATMENT.—If of recent origin, alteratives, such as mercury and potassium iodides, should be administered in high doses; if of long standing recourse must be had to operative procedure. That of Panas is preferred. This operation has for its object the securing of a connection between the lid and the frontalis muscle by means of a skin-flap. This flap is obtained by inserting a horn-spatula under the upper lid, and by making a horizontal incision about five millimetres above the margin of the lid through the skin and subcutaneous tissue; another incision, parallel to this and about one millimetre long, is made through the eyebrow, and is extended as far as the periosteum. Two incisions are then made at right angles to the first inferiorly, the flap of skin remaining between the two primary incisions is undermined, and the

tongue of skin drawn up under the bridge and held in position there by sutures.

Lagophthalmos.—By this term is meant an inability to close the eyelids. It is either due to paralysis of the facial nerve or is the result of some condition within the orbit, or in the eyeball itself, which causes the globe to protrude between the lids. As a result of the exposure to which the cornea is subjected, it frequently ulcerates, and, unless proper procedures be inaugurated, the eye is lost.

TREATMENT.—If due to paralysis of the seventh nerve, the cornea should be protected by carefully bandaging the eye during sleep, and by cleansing the conjunctival *cul-de-sac* with frequent washings of boric-acid solution. The primary cause of the paralysis must also be treated, and galvanism and hypodermic injections of strychnine may be tried. If the degree of lagophthalmos be excessive, the bandage should be worn constantly, and at times tarsorrhaphy is necessitated. This operation consists in uniting the margins of the lids by means of sutures after their skin has been removed from the ciliary border by a sharp knife.

Congenital Anomalies of the Eyelids.

Absence of a part of or all of an eyelid or of both eyelids has been noted, though very rarely. *Cleft eyelid*, or *coloboma* of the lid, has also been observed—usually in the upper lid. At times this deformity occurs on both sides.

EPICANTHUS.—This applies to the development of a broad fold of skin which extends from the inner border of the eyebrow to the side of the nose, its outer border being concave. This anomaly is usually associated with ptosis, or drooping of the upper lid over the globe.

Deformity of epicanthus associated with a deep depression over the root of the nose overcome by a canthoplasty fol-

lowed by a plastic operation which removes the crescentic folds and elevates the bridge of the nose. After the performance of the first procedure, two parallel and vertical incisions, one centimetre apart, are made at each side of the median line over the nose. From the middle of each of these incisions a rectangular flap is cut toward the inner canthi. After the lateral flaps are freely loosened and the central bridge of skin over the nose dissected up, the former is passed under the latter and the stitches are introduced through the three superimposed layers. Noyes (N. Y. Eye and Ear Infirmary Reports, '94).

Acquired Anomalies of the Eyelids.

It sometimes happens after injury, and especially after burns, that the edges of the lids become united to each other. This condition is known as *ankyloblepharon*. If the adhesion occurs at the outer angle of the lids, *blepharophimosis* is said to be present.

SYMBLEPHARON is a union between the lid and the eyeball, and is generally the result of a burn or some severe inflammation of the conjunctiva which has produced great shrinkage of the conjunctiva and cicatricial changes in the lids. The band of union may be but a delicate process of connective tissue, or the lid may be held down to the globe by an extensive cicatrix.

Treatment.—If the band be but slight, it may be severed by ligature, but if the attachment be more extensive, transplantation of healthy skin into the *cul-de-sac* may be necessary (Teale's operation), or the procedure of Harlan may be adopted. This author frees the lid from the globe by careful dissection of the band of attachment, and then makes an incision through the whole thickness of the lid along the margin of the orbit. A thin flap is then obtained from the skin below the lid, which is turned upward, as on a hinge, so that its raw surface is brought

into contact with the inner surface of the lid, while its smooth surface presents toward the globe. *Blepharophimosis* may be corrected by dividing the outer canthus by a sharp pair of scissors, or by uniting the conjunctiva and the skin-surface by sutures.

ECTROPION.—Ectropion, eversion of the eyelid, may be caused by traumatisms, especially burns, the cicatricial contractions drawing its tissues outwardly. Muscular or senile ectropion is seen in the aged, as a consequence of atrophy of the palpebral portion of the orbicularis and relaxation of the tissues.

Treatment.—In senile ectropion the deformity may usually be overcome by means of Snellen's sutures. This consists in burying a suture, which is entered at two points, one-third of an inch distant from each other, in the mucous surface of the lid, and passing deeply into the tissues between the skin and the mucous membrane. It is brought out upon the cheek, where the ends are tied over a piece of drainage-tube.

Literature of '96-'97-'98.

Very simple expedient for the correction of the deformity observed in cases of extreme non-cicatricial ectropion of the lower lid is as follows:—

The canaliculus is slit, and an incision made in the conjunctiva about one millimetre removed from the opening of the Meibomian ducts, this incision being carried the whole length of the palpebral aperture vertically through the conjunctiva and tarsus by means of a Graefe knife. From the middle portion of the tarsus the conjunctiva is then separated for a few millimetres, after which the tarsus is divided. Each free end is grasped in turn by means of a forceps, and dissected out to its extreme limits, care being taken not to excise any conjunctival tissue. Steven's tenotomy-scissors are the best used. A bandage is worn for a few days. The lid is massaged with vaselin, in an upward and

inward direction. A. E. Prince (Amer. Jour. of Ophth., vol. xv, No. 5, '98).

In cicatricial ectropion it is necessary to include in the incision the scar-tissue which has occasioned the eversion of the lid. If the cicatrix is small, Wharton Jones's operation will suffice. This consists in excising the cicatrix by means of a V-shaped incision. After the edges of the incision have been freely loosened from the sublying tissue they are approximated so as to form a Y. If the cicatrix be extensive, or if there has been much destruction of the skin of the lids and the neighboring tissues, transplantation of skin from neighboring or distant parts is necessary.

ENTROPION.—Inversion of the eyelid, the margin, its lids being rolled inward, may be *spasmodic*,—i.e., due to overaction of the orbicularis through irritation from concomitant disorders, conjunctivitis, keratitis, etc., or to undue application of bandages after operation; and *organic*, due to injuries, burns, ulcers.

Treatment.—The spasmodic form may readily be corrected by excising a narrow strip of skin from the lid parallel with its ciliary border. In organic entropion, on the other hand, it is necessary to include the tarsus in the operation, as this is usually distorted by the previous inflammation.

One of the best procedures for the cure of this deformity is that of Hotz. This is performed as follows: A transverse incision from canthus to canthus is made through skin and subjacent tissues, but, instead of being made near and parallel with the free border (as in the former methods), the incision is to follow the upper border of the tarsus. It therefore describes a slight curve beginning and ending at a point about two millimetres above the canthus, but being six to eight millimetres distant from the free border

in the centre of the lid. While an assistant is holding the edges of the wound well separated, the surgeon lifts up with forceps and excises with scissors a narrow bundle of the muscular fibres which run transversely along the upper border of the tarsus. The sutures, which are to include nothing but the cutaneous wound borders and the upper border of the tarsus, are then inserted. The first suture is placed in the centre of the lid; the curved needle, armed with fine, black, aseptic silk, is passed through the lower wound border; there taken again in the needle-holder, it is boldly thrust through the upper border of the tarsus and returned through the tarso-orbital fascia just above this border; and finally it is carried through the upper wound border. One similar suture is placed at each side of the central one, and these three stitches are usually sufficient for to draw the skin of the eyelid up toward the upper border of the tarsus and establish a firm union between these parts. This artificial union produces a slight tension of the tarsal skin, which, however, is sufficient to relieve any ordinary degree of entropion. But when the lids have been badly contracted—when the palpebral aperture has become unnaturally narrow or the free border of the lid has become entirely merged into the plane of the conjunctiva—these complicated cases require, in addition to the above operation, such surgical measures as canthotomy, the restoration of the free border either by grooving the tarsus or by grafting.

Literature of '96-'97-'98.

Caustic potash recommended in the treatment of senile entropion due to trachoma. Before cauterization the lid is soaked for ten or fifteen minutes in a strong solution of cocaine. The crayon of caustic is sharpened by rubbing on wet blotting-paper. The aim is to produce an eschar, three or four millimetres

wide, extending the whole length of the tarsus parallel to the margin, but nowhere nearer to it than two millimetres. The lid being everted and put upon the stretch, the crayon is drawn back and forth along the line about four millimetres from the lid-border until the epidermis is destroyed and the tissues beneath begin to assume a brownish color. When the action of the caustic has extended sufficiently, it is checked by the application of an acid solution, as diluted vinegar. No dressing is necessary. S. Theobald (Trans. Amer. Ophthal. Soc., '98).

Distichiasis and Trichiasis.

While distichiasis refers to the growth of the cilia along the outer marginal portion of the eyelid, trichiasis means a misplacement of the eyelashes. Both conditions are usually associated with entropion, especially when this condition is the result of chronic inflammation of the border of the lids.

TREATMENT.—Epilation or removal of the cilia by forceps may be tried if the stray cilia be not too numerous. Electrolysis may also be used in similar cases. Usually, however, excision of the misplaced cilia with the corresponding portion of the margin of the lid is necessary: This may be accomplished by making a V-shaped incision into the lid and by excising the flap so obtained, along with the truant cilia.

If the deformity be extensive, transplantation of the row of cilia is usually effected, and this is best accomplished by the Jaesche-Arlt operation. After a Knapp or a Snellin clamp has been applied to stop bleeding the lid is split in its whole length by a sharp knife; a second incision is then made through the skin of the lid about five millimetres from its free margin and running its entire length. A semilunar flap of skin is then removed from the lid by carrying a third incision in a curve the entire length of

the second incision. The edges of this incision are approximated by sutures, and the cilia drawn upward away from the globe.

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PANCREAS, DISEASES OF THE.

Pancreatic Hæmorrhage and Acute Pancreatitis.

HÆMORRHAGE.—Hæmorrhage into the pancreas occurs occasionally from a crushing injury, or a blow on the abdomen, lacerating the gland. It may occur also from rupture of a diseased vessel. Chronic venous congestion caused by heart disease may lead to small, disseminated bleedings. A more interesting class, however, are rare, grave cases in which hæmorrhage occurs from unknown causes. Zenker in 1874 first brought this condition prominently into notice as a cause of sudden death, and later Draper and his Boston *confrères* directed the attention of the American profession to it. It may occur with or without inflammation of the gland, or there may be necrotic changes in it. In absence of inflammation the digestive action of the pancreatic juice has been attributed as a cause. A nervous origin has been assigned to some cases in which foci of hæmorrhage in the lungs were also found.

The hæmorrhage may be limited to a part of the gland or it may infiltrate the whole gland and the retroperitoneal tissues, even rupturing into the lesser peritoneal cavity and filling it with blood.

ACUTE PANCREATITIS.—With pancreatic hæmorrhage there may be inflammation which not infrequently terminates in necrosis. Inflammation may, however, occur without hæmorrhage; it then tends rather to suppuration than

gangrene. It occurs most frequently in males from 25 to 60 years of age; in 41 cases only 4 were females (Körta). I have reported a case in a male infant aged 9 months. Painful gastro-duodenal disturbances have preceded in many cases, the inflammation evidently extending back along the duct. It is thus probable that indulgence in alcohol plays a part in its production.

Symptoms.—In both pancreatic hæmorrhage and pancreatitis the onset is usually sudden, but may be preceded by some uneasiness in the abdomen. Usually there is intense diffuse pain in the epigastrium; it may be constant or paroxysmal. Nausea and vomiting are early symptoms, increasing in severity, but without relief. The vomit consists of food and mucus chiefly, but may contain blood in various stages of disintegration. Marked prostration, or even collapse, soon follows, probably from injury to the solar plexus. The temperature is normal or subnormal in cases of hæmorrhage without inflammation, and may not be high in the inflammatory cases in which the fever may be preceded by chills. The abdomen usually becomes distended in the upper zone and there is tenderness in the epigastrium. A mass may be palpable in the situation of the pancreas. The bowels are usually constipated, but there may be diarrhoea.

Diagnosis.—Lesion of the pancreas is indicated by the sudden onset of violent pain in the epigastrium, with vomiting, and soon followed by collapse. In the course of some hours there is usually tenderness and swelling in the epigastrium, and, in the inflammatory cases, some fever. Perforating ulcer of the stomach or duodenum may be suspected, but can generally be excluded by a previous history of pain after food, and hæmorrhages, and the more general peri-

tonitis that usually follows. Duodenal cases may present much difficulty, as perforation may occur without any previous history of pain or disturbed digestion. The symptoms develop suddenly and the pain and collapse may be as marked. Moreover, duodenal ulceration occurs chiefly in the same class as pancreatic disease; that is, in males over forty years old.

Irritant poisoning may be excluded by the history and the character of the vomit. Biliary colic is excluded by the absence of collapse, a history of previous attacks, and jaundice is present, but its frequent absence must be kept in mind.

Intestinal obstruction is the condition most frequently suspected. The onset, however, is less sudden, the distension and tenderness are not confined to the epigastrium, and a tumor may be found at the seat of obstruction. Inflation of the colon may determine the seat of obstruction.

Literature of '96-'97-'98.

The diagnostic points which will help to differentiate suppurative pancreatitis from other acute conditions of the abdominal viscera are as follow: 1. The location of the primary seat of disease in the epigastrium. 2. The suddenness of the attack, with severe gastric, epigastric, or abdominal pain, accompanied by great prostration and vomiting. 3. Tenderness in the epigastric region, with tympanites and a mass recognizable by deep palpation. 4. Absence of fever, or but moderate fever during the first two or three days of the attack.

In addition to these, there may be sugar in the urine. The question of fatty stools and the relation of this symptom to pancreatic disease is still an undecided one. G. R. Fowler (Brooklyn Med. Jour., Apr., '96).

Morbid Anatomy.—The gland is enlarged throughout or in some part, and

infiltrated with blood, the color of which varies with the duration of hæmorrhage and the severity of inflammation. A section may show a variegated surface, with opaque white spots due to fat-necrosis. Extensive hæmorrhage may be found in the root of the mesentery in retroperitoneal tissue, and about the kidneys, especially the left. In these parts areas of necrosis of fatty tissue are often found. If gangrene results, the gland or part of it may be converted into a dark-gray mass, wholly or partly separated from its attachments and lying in the lesser peritoneal cavity or in the cavity of a large abscess. The surrounding peritoneal surfaces become covered with a fibrinous exudate. The sac of the lesser peritoneum may contain a large quantity of dark, offensive fluid in which masses of necrotic fat may be found.

Perforation, with discharge of this exudate, may take place into the stomach or duodenum, and recovery follow.

In suppurative pancreatitis a single abscess or multiple abscesses may form, or there may be diffuse purulent infiltration of the surrounding tissues. Perforation into the stomach or duodenum may occur. Fat-necrosis is rare in these cases.

Septic thrombus of the splenic vein may form and lead to infection of the portal vein and multiple abscesses in the liver. The spleen is not usually much enlarged. The pleura and pericardium may become infected by extension of the inflammatory process through the diaphragm. Various bacteria, especially the colon bacillus, are found in the affected tissues.

The constancy of the presence of *fat-necrosis* in hæmorrhagic and necrotic pancreatitis is a striking feature of disease of the pancreas. The condition is rarely met with apart from affections of

the pancreas. It has been produced experimentally by inserting pieces of pancreas beneath the skin or into the subperitoneal fat, and by experiments on the pancreas itself. The areas vary greatly in size, some being as small as a pin's head, others as large as a hen's egg. They are soft in consistence. Flexner has found a fat-splitting ferment in them; it disappears within a few days.

Literature of '96-'97-'98.

Pancreas examined in 75 cases. In 11 total necrosis of connective tissue was found, the protoplasm or the cells being homogeneous and the nuclei staining poorly or not at all; in 29 cases there was disseminated necrosis of the acini and connective tissues; in the remaining cases there was no necrosis. The necrosis is evidently one of autointoxication. Chiari (Zeit. f. Heilk., B. 16, p. 70, '96).

Fat-necrosis appears in the fat on the surface of the pancreas and vicinity; similar nodules may be present in the fat of the peritoneum at points more remote, denominated disseminated or multiple fat-necrosis. Peritonitis is not usually present. Pancreas studied in 80 dead subjects, and fat-necrosis found in only 2. Pancreas of 100 hogs examined, and fat-necrosis found in the interlobular fat in 2. In some instances the fat-nodules were found sterile. The bacillus coli communis was oftenest present. H. U. Williams (Med. Record, July 10, '97).

The best results of obtaining fat-necrosis were obtained after ligating the veins and lacerating the pancreas on cats and dogs. The necrosis varied in extent and size from that of a pin's head to that of a pea. Although it cannot be confirmed that steapsin was the direct cause of necrosis of the tissue, such an assumption is rendered highly probable by its constant occurrence in diseased areas and its absence from healthy fat and the nature of the pathological changes. The escape of the pancreatic secretions into the peripancreatic and parapancreatic tissues is the origin of the necrosis. This escape is chiefly the

outcome of lesions of the pancreas, but also of disturbances in its circulation. The pancreas in case of fat-necrosis suffers in two ways: it undergoes necrosis in the same way as the adipose tissue, or it is invaded by new growth of connective tissue, not limited strictly to the field of necrosis. In this way small nodules characteristic of interstitial pancreatitis, with a loss of parenchyma, may be formed. Flexner (*Jour. Exper. Med.*, July 1, '97).

Prognosis.—Severe cases are generally fatal, but many mild cases probably occur and recover. Death may be due to collapse and occur within a few days, or cases that recover from the shock may succumb to septicæmia some weeks later. Osler and Körte report cases of recovery after laparotomy, and Trafoyer one of recovery after sloughing of the pancreas and its discharge by the rectum. In a case of my own in which there were some premonitory epigastric pains and distress followed by extreme pain and collapse, there was accumulation of serous exudate in the lesser peritoneal cavity. After its evacuation a cyst of the pancreas formed; recovery followed drainage.

Literature of '96-'97-'98-'99.

In hæmorrhagic necrosis of the pancreas, if the patient lives long enough, a retroperitoneal abscess and septic symptoms mostly occur. In a very few cases the necrotic pancreas is got rid of spontaneously by the bowel, or artificially by an operation wound. A tumor may be felt at the level of the umbilicus, separated from the liver and lying behind the stomach and colon. The urine at first usually contains no sugar. Disseminated fat-necrosis may be present. Of eleven patients which have been operated on as yet, only one recovered, and this one afterward suffered from severe diabetes. Two complete recoveries are known to have occurred spontaneously after the evacuation of necrotic pancreatic tissue by the bowel had been confirmed by

microscopical examination. R. Morian (*Münch. med. Woch.*, Mar. 14, '99).

Treatment.—This is purely symptomatic. The extreme pain and the collapse require the subcutaneous injection of morphine and the administration of stimulants by the stomach or rectum. In hæmorrhagic cases with a fatal collapse threatening, it may be justifiable to open the abdomen and relieve the pressure on the solar plexus, to which death is probably due, rather than to loss of blood. It is only by operation that existence of a remediable cause such as perforation can be excluded. In the inflammatory cases operation may be advisable as soon as an accumulation about the pancreas or in the lesser peritoneal cavity can be demonstrated. In the meantime the patient's strength should be sustained as far as possible by easily assimilable nourishment.

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Following conclusions drawn regarding surgery of the pancreas: 1. It is possible to operate on the head of the pancreas if one spares one of the two excretory ducts. 2. Small wounds in the ductus choledochus can heal without closing the lumen of the duct. 3. If the whole head of the pancreas is removed, it is not possible by any means yet known to restore the flow of pancreatic secretion into the intestine, and death results. 4. The pancreatic secretion coming in contact with peritoneum may be indirectly the cause of peritonitis; hence every wound in the pancreas must be well closed, or else the affected tract must be treated extraperitoneally. 5. Complete extirpation of the pancreas, when it does not cause death by infection, by lesion of the nerve-plexuses, or intestinal necrosis, causes it by elimination of its function.

In regard to operations, the surgeon has a good chance of success in solid benign tumors of the head if not too extensive; in cysts, hæmorrhages, and ab-

scess; in localized fat-necrosis; in primary tuberculosis, calculus, and "annular pancreas." D. Bottini (*La Clinica Chir.*, Mar., Apr., '96).

In operating on the pancreas the surgeon should always endeavor to guard the surface of the peritoneum against contact with the pancreatic secretion. The abdominal cavity should be carefully plugged, or the operation as far as possible should be made an extraperitoneal one. Körte (*Berl. Klin.*, Dec., '96).

Chronic Pancreatitis.

Symptoms.—The symptoms of chronic pancreatitis are those of digestive disturbance with epigastric distress, and are not distinctive of pancreatic disease. With atrophy of the gland diabetes not infrequently occurs. Enlargement of the head may cause obstruction of the common bile-duct, with jaundice and distension of the gall-bladder.

The chronic form of inflammation of the pancreas may arise from local or general conditions. The local are the most common, and consist of extension of an inflammation having its origin in catarrh of the duodenum or bile-passages and extending along the pancreatic ducts to the gland-tissue, or it may originate in an obstruction of the pancreatic duct. Of the general causes syphilis and alcohol are most common, the latter acting probably by exciting catarrhal inflammation of the duct.

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In congenital syphilis the pancreas is less often affected than the spleen, liver, bones, and lungs, but more frequently than the thymus, heart, intestine, and other viscera. The organ in question may be attacked very early, even in the fifth month of uterine life, or not till near or after birth. Its diseased condition is not uniformly associated with changes in neighboring organs, though the duodenum is occasionally involved. Gummata, great and small, are exceptional. Peritoneal adhesions are not

rare in congenital cases. The pancreas does not seem much enlarged, but it is always abnormally firm in consistence, so as to feel in typical cases as tough as cartilage. The head is always more affected in this way than the tail. The disease is essentially diffuse interstitial pancreatitis. The interacinous tissue increases rapidly, beginning chiefly around the vessels, themselves affected with periarteritis and endarteritis at an early stage. Proliferating tissue undergoing sclerotic changes, the glandular elements of the pancreas are soon irretrievably damaged. Schlesinger (*Virchow's Archiv*, Dec. 20, '98).

Pathology.—The whole gland may be affected or only a part of it, usually the head. This portion of the organ may be small and very hard from the fibrotic change, as is met with in some cases of diabetes. On the other hand, it may be so large as to form a palpable tumor; not infrequently the enlargement is confined to the head, which becomes so hard as to closely simulate carcinoma. The surface of the gland may be smooth or nodular, or even granular and of a grayish-white color. The duct may be normal or more or less irregularly dilated, especially if there has been obstruction of the duct.

Treatment.—The treatment is essentially dietetic, the aim being to reduce the quantity of articles of food requiring the pancreatic ferment for their conversion. Hence the consumption of fats and starches should be restricted. Minced animal pancreas has been used by Abelman with success; pancreatin (*q. v.*) is a more convenient remedy. Small doses of bicarbonate of soda, twenty minutes after meals, tend to allay the local pain.

Cysts of the Pancreas.

Symptoms.—The symptoms are indefinite. The onset may be with the symptoms of acute pancreatitis, or only with

disturbance of digestion and epigastric discomfort. The attention may first be arrested by the discovery of a tumor, which may grow rapidly; in chronic cases it usually develops slowly. It may be subject to rapid enlargement from time to time, possibly on account of hæmorrhage. The tumor is usually smooth and rounded, lying chiefly to the left of the middle line of the body. It is only slightly movable and is not affected by respiration. It may transmit the aortic impulse, but it is not expansible. In large cysts fluctuation can sometimes be elicited. The cyst may grow until it distends the whole abdomen, extending from the ensiform cartilage to the pubes. It projects into the left lumbar region, rendering it flat to percussion and resistant. By its pressure it may interfere with respiration and disturb digestion. Sugar is present in the urine of some cases.

Diagnosis.—The diagnosis is usually only probable. The position of the tumor, its relation to the stomach and colon which can be determined by inflation of these organs, its general characters, and the history of its development, usually indicate its pancreatic origin. Even after exploratory puncture the nature of the cyst may remain uncertain, as the contents may have lost the digestive ferments, and these may be present in cysts communicating with the pancreas. A persistent discharging sinus is in favor of a pancreatic cyst.

Hydronephrosis, especially of the left kidney, and dropsy of the gall-bladder have to be excluded, as has also a large ovarian cyst. Distension of the lesser peritoneal cavity is often indistinguishable from pancreatic cyst. As a rule, the contents consist of serous fluid, do not contain the digestive ferments, and do not reaccumulate after evacuation.

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A valuable diagnostic point is brought out by the insertion of an hypodermic needle into the cyst-walls, the evacuation of the fluid and the examination of the same, the fluid, in the great majority of cases, being of a chocolate hue. Paul F. Eve (Med. and Surg. Reporter, May 9, '96).

Multilocular cyst of the tail of the pancreas which simulated hydronephrosis successfully excised. Malcolm (Med. News, Jan. 22, '98).

Cysts probably form in the pancreas most frequently from obstruction of the duct or one of its branches; they may arise also from circumscribed collections of fluid in the substance of the gland. Many supposed cysts of the pancreas doubtless form wholly outside the gland.

They occur equally in both sexes and usually in adult life, but are met with occasionally in young children. The largest group of cases results from inflammation of the gland or the duct. The tumor may develop rapidly, or may not appear for some weeks or even a year or two.

[In a remarkable case of my own there was an attack of acute pancreatitis followed by dropsy of the lesser peritoneal cavity. This was opened and the pancreas found somewhat irregularly enlarged. A few weeks later the epigastrium again became prominent. The tumor becoming extremely large, a second operation was done and a grayish, flocculent fluid containing no digestive ferment evacuated, but later the discharge from the sinus gave distinct evidences of being pancreatic fluid. The man is now in good health, but the discharge still continues. ALEXANDER MCPHEDRAN.]

A second group of cases follow traumatic injury of the abdomen. Of 33 cases collected by Körte, 30 were in males. Probably many of them were due to accumulation of fluid in the lesser peritoneal cavity or to cystic for-

mation in the vicinity of the gland. Doubtless some of them were due to inflammation of the gland or duct, causing occlusion of the latter and retention of secretion as in the first group. Some of them may have originated from hæmorrhage into the pancreas.

Seventeen cases collected in which cysts of the pancreas had been attributed to traumatism, the time between the injury and the cyst-formation varying from ten days to eight years. The view as suggested by Senn and Cathcart believed that at first the cyst is due to rupture of tissue and the escape of blood and pancreatic fluid; that an adventitious wall forms around this and becomes distended by the escape of more fluid. Leith (*Edinburgh Med. Jour.*, Nov., '95).

In a third group there is no history of injury or of inflammation. These are met with in women especially, and run a very protracted course: some years usually.

Pancreatic cysts generally project forward between the stomach and transverse colon. In some cases, however, it appears above, the stomach pushing it downward, and in rare cases it develops low down in the abdomen, both stomach and transverse colon lying above the tumor. They are usually in the middle line of the body, but may lie to the left, near the spleen if developed from the tail of the pancreas.

The contents of cysts vary in character. Probably in smaller cysts the fluid is dark brown and contains blood or blood-pigment, fat-granules, degenerated epithelial cells, and, it may be, cholesterolin. Large cysts are older and the contents are usually grayish, of alkaline reaction, and from 1010 to 1024 specific gravity. The fluid may not only emulsify fat and convert starch into glucose, but also digest albumin and fibrin. The last only is distinctive of the pancreatic

origin of the fluid, as the contents of other cysts may possess diastatic and emulsifying power. It is also important to note that the fluid of pancreatic cysts in time loses digestive power.

Treatment.—The smaller pancreatic cysts accidentally discovered call for no treatment. Large cysts require surgical intervention, removal when possible; but drainage is all that can be effected in most cases. Either method is usually successful; however, a fistula may remain open even for years in cases of drainage.

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The treatment of pancreatic cysts is divided into incision of the sac and drainage—the walls of the cyst being attached to the abdominal parietes, a drainage-tube inserted, this being constantly shortened until finally removed—and the complete removal of the cyst. The objection to drainage by incision of the cyst is, in some cases, the establishment of a permanent pancreatic fistula, the escape of the fluid into the peritoneal cavity, and the reaccumulation of the cyst after evacuation.

The ideal operation is the complete removal of the cyst from the abdominal cavity. Personal case in which this latter operation was successfully performed. P. F. Eve (*Med. and Surg. Reporter*, May 9, '96).

Tumors of the Pancreas.

Of the tumors of the pancreas, cancer is by far the most frequent and important. The head is the usual seat, rarely the body and tail. The cancer is usually of the scirrhus variety, but cases of soft and of colloid growths are occasionally met with. Wirsung's duct is often obstructed and not infrequently the common bile-duct also, causing intense and persistent jaundice. By the size of the tumor or on account of implication of the wall of the intestine, it may cause obstruction of the duodenum. It occurs most frequently between the ages of 30

and 50, but may be met with at any age, even in infancy. Unlike cancer of the gall-bladder, it rarely occurs with calculi. It is usually primary, but the pancreas may be the seat of secondary metastatic tumors when the disease becomes generalized. Carcinoma of the stomach or duodenum rarely extends to the pancreas.

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Pancreas examined post-mortem in one hundred cases for fat-necrosis, but found none. The only disease discovered was carcinoma, and in one or two of these the gross appearance was that of fat-necrosis, but the microscope showed cancer. Blaisbrook (Med. Record, July 10, '97).

The symptoms are very indefinite and rarely sufficiently distinctive to render a diagnosis possible. There is not rarely a long history of disturbed digestion. Of the disease itself there may be such suggestive symptoms as epigastric pain from time to time, loss of flesh and vigor, the presence of a tremor in the epigastrium, the occurrence of jaundice with enlargement of the gall-bladder, and ascites from pressure on the portal vein. Such symptoms are present only in a minority of cases. There may be glycosuria, and undigested meat-fibres may appear in the stools. The most important evidence consists in the presence of a fixed tumor, the occurrence of extreme and persistent jaundice, an enlarged gall-bladder, and the development of cachexia and emaciation.

When a patient suffers from deeply-seated pain in the epigastric or hepatic region, with progressive emaciation, but without signs definitely indicating gastric cancer, with jaundice and dilatation of the gall-bladder, without a history of biliary colic, by far the most probable diagnosis is primary cancer of the pancreas. This diagnosis is not much affected by the state of the liver, which

may be large or small and may or may not contain palpable cancerous growths. If the gall-bladder is not dilated the diagnosis must remain uncertain. These views are based on the post-mortem examination of seventeen cases. W. P. Herringham (St. Bartholomew's Hosp. Reports, London, vol. xxx, p. 5, '94).

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In an inoperable case of carcinoma of the pancreas the effect of pancreatic juice upon the absorption of fat was studied. When the patient was on a milk diet, a decidedly excessive quantity of the ingested fat was lost, or, in other words, fat-absorption was distinctly impaired. The fat-splitting process was accomplished as fully as in health, probably by micro-organisms, as it was shown that the bacterial activity of the intestine was more pronounced than in health. The putrefaction of proteids in the intestine was excessive. W. P. Northrup and C. A. Herter (Amer. Jour. Med. Sci., Feb., '99).

The outlook is, of course, hopeless, death occurring usually within a few weeks after the occurrence of the more grave symptoms.

Of other tumors, sarcoma, lymphoma, adenoma, and gumma are occasionally met with; syphilis more often causes diffuse interstitial infiltration. Miliary tubercle is not rare.

In a study of 128 cases of tuberculosis the pancreas was found tuberculous in 13, or in 9.37 per cent. The pancreatic disease seems to be always secondary, either by extension from neighboring organs or hæmatogenous in miliary tuberculosis. Sex plays no rôle; age, on the contrary, is an important factor, 44.44 per cent. of the bodies of children examined presenting tuberculosis of the pancreas. Kudrewetski (Zeits. f. Heilk., B. 13, H. 2, 3, '93).

Pancreatic Calculi.—Concretions are sometimes met with in the pancreatic duct similar to those occurring in the salivary glands. They are usually small,

like grains of sand, but may be as large as a walnut. They are usually multiple. They are generally round, and grayish white in color, and composed chiefly of carbonate of lime with some phosphate. Cholesterin is reported present in some cases. They occur in dilated ducts or may be the cause of obstruction and dilatation of the ducts. They may excite chronic interstitial inflammation of the gland or acute suppurative inflammation.

Literature of '96-'97-'98.

Efficient cause of pancreatic calculus believed to be chemical alteration of pancreatic secretion, due, in most cases, to the action of microbes. Mere retention of secretion, although a predisposing condition, is not an efficient cause, for CaCO_3 predominates in pancreatic calculi, whereas it is not present in the normal secretion. Calculus appears not uncommonly in connection with diabetes (22 times in 225 cases). It is more common in men than women (19 men, 7 women), and chiefly attacks people of late middle life. Giudiceandra (Il Policlinico, Mar. 15, '96).

The symptoms at best are very indefinite. There is usually a preceding history of gastro-duodenal indigestion. The stone in its passage or incarceration may cause symptoms identical with those of gall-stone colic even to the jaundice, which, however, may be absent in both. Following the paroxysms of pain, calculi may be found in the stools, while, sometimes, transient glycosuria follows the attacks of colic. There may be symptoms of acute or chronic pancreatitis and cyst of the pancreas may form. There may be much muscle-fibre in the stools, which may also be fatty. The patient may lose flesh and strength.

The diagnosis can only be surmised, unless calculi are found in the stools.

The treatment is similar to that for

biliary colic. Good results are reported from the hypodermic injection of 1 cubic centimetre of a 1-per-cent. solution of pilocarpine, three times a week.

ALEXANDER MCPHEDRAN,

Toronto.

PANCREATIN.—Pancreatin (pancreatinum, U. S. P.; extract of pancreas, pancreatic extract) is a mixture of the enzymes existing in the pancreas of warm-blooded animals, usually obtained from the fresh pancreas of the hog. Pancreatin occurs as dry, whitish or yellowish-white, brittle scales, or oftener as a yellowish-white, amorphous powder without odor, or having a peculiar odor and a faint, meat-like taste. It is almost completely soluble in water, insoluble in alcohol, soluble in dilute alcohol, and is precipitated from solution by alcohol in excess. It is not an artificial compound. It should be absolutely free from all added substances and contain the ferments as they are naturally associated in the pancreatic glands. Five ferments are to be found in pancreatin: trypsin, which converts albumins, or proteids (of milk, beef, fish, blood, etc.), into peptone in either neutral, alkaline, or slightly acid media; diastase, or amylopsin, which resembles ptyalin very closely and converts starches into dextrin and sugar; an emulsive ferment which emulsifies the fats; steapsin, which splits fats into glycerin and fatty acids; and, finally, a milk-curdling ferment.

Extemporaneous Preparation.—An active preparation may be prepared as follows: The fresh pancreas of a pig, killed about six hours after a full meal, is chopped fine and to it is added four times its weight of dilute alcohol. After standing for twelve hours pour off the liquid portion and filter it. The liquid

may be given in doses of 1 to 2 table-spoonfuls. Another method, given by Hare, is as follows: Wash and chop up fine a fresh pancreas, and allow it to soak in alcohol for twenty-four to forty-eight hours. After this squeeze out the alcohol and add to the pancreas 10 times its weight of glycerin. Allow it to stand for forty-eight hours and then filter. This may be given in doses of 30 drops in a glass of milk. The solutions or liquid extracts from the pancreas are, however, objectionable and inferior to the dry pancreatin, principally because of the tendency of these solutions to precipitate and to undergo deterioration owing to the large amount of organic matter present. The diastasic power especially is variable and weak, and tends constantly to diminish. Furthermore, these solutions impart their peculiar, repulsive taste to foods, milk, and gruel, etc. For these reasons it is always best to use a dry extract of pancreas (pancreatin).

Physiological Action and Tests for Pancreatin.—The value of a pancreatic preparation depends upon its digestive activity and upon the quality of the resulting digested product. A pancreatic extract may peptonize milk perfectly, but the peptonized milk may be unfit for food, owing to the development of rancid fatty acids, giving the milk a peculiar, sour, repulsive odor. A good pancreatin should rapidly digest milk, beef, fibrin, and all forms of starchy food. It should convert the casein of milk into peptone without the development of any rancid flavor. The action upon casein may be taken as a satisfactory test of the proteolytic power of any pancreatin. The activity of a pancreatic preparation upon a proteid may be tested as follows: Place into a flask or bottle 15 grains of sodium bicarbonate, add 5 grains of dry pancreatic extract, or pancreatin; mix well

and add 1 pint of milk warmed to 130° F. Shake well and place the bottle conveniently for observation. At first there should be no odor or taste imparted to the milk. In a few minutes the milk will become of a slightly grayish-yellow color which in ten minutes will be more marked, somewhat thinner, and of a distinctly-bitter taste, due to the conversion of the casein. This taste is a pure bitter without suggestion of rancidity. For purpose of comparison, a second flask of milk mixed with the soda and water without the pancreatin may be prepared. By withdrawing a small portion of the milk from time to time and adding a few drops of acetic acid, the conversion of the casein may be tested by the character of the curd formed—from the tough casein, to the light, flocculent precipitate, and the final, slight, scarcely perceptible, granular coaguli. The diastasic power of a pancreatic preparation may be tested as follows: Mix 1 drachm of arrowroot or starch with 5 fluidounces of cold water, and boil well. To a fluid-ounce of this thick starch (at 110° F.) add a grain or two of pancreatin, or dry pancreatic extract, or a few drops of a fluid product, and stir well. The starch should almost instantly become thin and fluid, like water, showing the formation of soluble starch, which is gradually converted into dextrin and glucose. A product which does not quickly liquefy thick, warm starch-jelly is worthless as a diastasic agent. (Fairchild's "Hand-book of the Digestive Ferments.")

Therapeutics.—Pancreatin is extensively used in the preparation of pre-digested or peptonized foods. It acts best in an alkaline medium, although the use of an alkali is not essential to the action of the pancreatic ferments. To peptonize food is to digest food artificially, to submit it to the action of the

digestive ferments, whereby changes are effected precisely similar to those which in the living body are essential before it can be absorbed. Flesh and starch foods are incapable of being absorbed until by the action of the digestive juices they have become soluble. Pepsin is not available for household use in artificially digesting food of any kind. Peptonized food is, therefore, not food prepared with pepsin, or necessarily containing a ferment of any kind; it is digested food. The pancreatic ferments are capable of digesting every known form of food. The peptonizing action is most energetic at about the heat of the body, slow at the temperature of a room (60° to 70° F.); at a lower temperature, even at freezing, the peptonizing agent is not destroyed, but is simply inactive; at the boiling-point (212° F.) it is at once destroyed. Peptonized foods are valuable in all cases where the digestive functions are impaired, during the course of acute fevers, and in chronic wasting diseases. They also fill a useful office during the period of convalescence from acute and exhausting diseases. They are therefore valuable in typhoid fever, gastric ulcer, acute dysentery, chronic diarrhœa, gastric catarrh, pneumonia, tuberculosis, and diabetes. For infants, peptonized milk or milk prepared by Fairchild's peptogenic milk-powder or by means of Fairchild's extractum pancreatis or peptonizing tubes, is a valuable substitute for mothers' milk. When rectal alimentation is rendered necessary either from inability to swallow or from inability of the stomach to retain or digest food, peptonized nutritive enemata become of inestimable value. These may be composed of milk alone or with egg, of egg-albumin, or of beef peptonized before being used.

DIGESTIVE DISORDERS.—Pancreatin, in doses of 3 to 10 grains in capsule, given

about two hours after meals, and preceded by 10 or 15 grains of sodium bicarbonate, will assist insufficient salivary and intestinal digestion. It is also beneficial in lenteric diarrhœa. In diabetes mellitus dependent upon a lesion of the pancreatic gland (carcinoma or atrophy) the use of pancreatin and of peptonized foods are strongly indicated.

DIPHTHERIA.—In diphtheria pancreatin has been used in spray and powder for the purpose of destroying the false membrane and favoring its expulsion. It is usually combined with sodium bicarbonate (3 parts to 1 of soda) for insufflation as a powder; or 15 grains of pancreatin and 5 grains of sodium bicarbonate, with a drachm of glycerin in 1 ounce of water may be used as a spray. The latter should be prepared fresh every few hours. Samuel Johnson has suggested (*Jour. Amer. Med. Assoc.*, July 29, '93) the addition of $\frac{1}{4}$ grain of corrosive sublimate. Better as a solvent for diphtheritic membrane is the use of trypsin, as it presents the proteolytic ferment of the pancreas in the most active form. Trypsin may be applied by insufflation, pure or mixed with sodium bicarbonate—4 grains of trypsin to 1 grain of soda; it may be applied on a moistened brush or probe covered with absorbent cotton; or mixed with water and sprayed: trypsin, 15 grains; sodium bicarbonate, 5 grains; water, 1 ounce; to be prepared fresh every few hours, or chloroform or pure creasote, 4 drops, may be added as a preservative.

SURGICAL SOLVENT.—The proteolytic action of pancreatin has been utilized in the treatment of urethral and œsophageal strictures, for dissolving sloughing tissue, coagulated blood, and muco-pus. C. D. Jones, of Brooklyn, has used pancreatin or pancreatic extract for cleaning out ulcerous cavities in a case of hip-joint

disease. A solution of 1 drachm to the gill of water was poured into an abscess-cavity, remaining one week after an excision, and left in place a half-hour. Upon irrigating, numerous shreds of broken-down ligamentous tissue and many spicula of dead bone that had become imbedded in the soft tissue and that had previously escaped both irrigator and curette were washed out. In hæmorrhage of the bladder, with the formation of clots, pancreatic extract in solution, with or without soda, may be used to dissolve the coagula.

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PARALDEHYDE.—Paraldehyde (paraldehydum, U. S. P.) is a polymeric form of ethylic aldehyde. It occurs as a colorless liquid (crystallizes below 50.9° F.), having a peculiar, aromatic, suffocating odor and warm taste. It is soluble in alcohol, ether, oils, and chloroform, and in 8 to 10 parts of cold water, but less readily in hot water. When small bulk is desired, it may be given in an equal volume of oil of sweet almonds. The dose is 30 to 90 minims in capsules, or well diluted with simple elixir, sweetened water, brandy, or rum.

Physiological Action.—The weight of evidence tends to sustain the views of Gordon, who in a series of experiments found that paraldehyde was mainly eliminated by the lungs, being readily detected in the breath six or eight hours after its ingestion. In the urine it can also be recognized three or four hours after ingestion. The drug markedly increases the elimination of urea, accompanied, however, by increase of the watery constituents. Small doses produced no fall of arterial pressure in cats and rabbits, but large doses caused a considerable fall. In man it also lowers

heart-pressure. Injected intravenously it soon caused death through heart-depression, after a gradual increase of the pulsations. Paraldehyde depresses reflex action and reduces muscular tetany.

Poisoning by Paraldehyde.—Thomas MacKenzie, of Douglass, England, records (*Brit. Med. Jour.*, Dec. 12, '91) a case of poisoning by paraldehyde, in a woman who took $3\frac{1}{3}$ ounces. Several hours after the drug was taken she was found in a deep stupor and limp, like one under the influence of chloroform, with a strong odor of the drug on her breath, face slightly flushed, pupils moderately contracted and quite insensible to light; pulse, 120; respirations, 40. Notwithstanding every means was used to arouse her, it was forty-one hours from the time the drug was taken before she was sufficiently aroused to understand and answer simple questions. When death occurs, it is from respiratory failure. It is not so depressant to the heart as chloral.

Paraldehyde Habit.—Several cases of the paraldehyde habit are on record, and the results, physical and mental, have usually been most wretched, where the habit was kept up for a long time.

Case of paraldehyde habit in which the woman had taken 1-ounce doses nightly for months, and, instead of suffering ill effects, had grown fat. Frederick Peterson (*Med. Rec.*, Dec. 10, '92).

Report of a case in which patient was accustomed to take 16 ounces of paraldehyde weekly. Patient became rapidly emaciated, suffered great cardiac and general muscular weakness, and subsequently had delusions of persecution with mental failure. Complete recovery followed restraint and appropriate treatment after three months. F. A. Elkins (*Quar. Jour. of Inebriety*, Oct., '94).

Symptoms resembling those of chronic alcoholism generally follow the long-continued use of the drug in large doses.

Krafft-Ebing has observed epileptoid convulsions in these cases.

Literature of '96-'97-'98.

Case of paraldehyde delirium tremens in a man, 41 years of age, who was taking 2 ounces of this drug each day. He could stand with difficulty, and, although his intelligence was not impaired, his speech was labored, and words were delivered in syllables in order to improve this deficiency. His nutrition was enfeebled, skin pale, and brow covered with perspiration. The eyeballs were deeply sunken, without disturbance of motion, and his look was fixed. Pupils were in middilatation, but reacted well to light. There were no painful points on head or spine. There was marked tremor of hands and tongue, and the latter was coated. Spinal innervation was unchanged. The lungs showed marked emphysema; apex-beat was absent; heart-sounds muffled; pulmonic second sound accentuated; pulse slightly irregular, ninety to the minute, and moderately full. Abdomen was retracted. Urine was very acid, contained a large quantity of urates, of specific gravity of 1030, but free from albumin and sugar. Patient was sleepless, became delirious, had ideas of persecution and hallucinations, but improved under sodium bromide and trional, and finally was discharged after sixteen days of observation. G. Reinhold (*Ther. Monats.*, H. 6, S. 300, '97).

Treatment of Poisoning by Paraldehyde.—The treatment of poisoning by paraldehyde is directed against the paralysis of the respiratory centre. Respiratory stimulants, atropine, coffee, and the battery are indicated.

Therapeutics.—Paraldehyde is used chiefly as an hypnotic and nervous sedative. On account of its depressant effect upon the respiratory centres, W. H. Flint (*Ther. Gaz.*, Jan. 15, '90) claims that it is contra-indicated in cases of cyanosis with depression of the respiratory centres, as in the advanced stages of emphysema and cardiac dilatation; he believes it to

be likewise contra-indicated in most cases of insomnia attended with much physical or mental depression. Bright's disease does not appear to prohibit the use of paraldehyde.

In the sleeplessness of chronic alcoholism, alcoholic mania, delirium tremens, and "chronic disturbers," B. D. Evans, of Morristown, N. J., finds paraldehyde the best hypnotic. In many of the forms of insanity he has found it to act well, but occasional failure follows. He has not found the drug to disturb the appetite or depress the heart's action ("Ephemeris of Mat. Med.," Jan., '96).

Results of paraldehyde compared in 100 cases with the results obtained from the use of sulphonal in 166 cases. Patients suffered from various diseases of the mind, and following conclusions are reached: 1. That, of the two drugs, paraldehyde is the safer for continuous use and has a wider range of usefulness, as it can be administered where pain, cough, or fever exists. 2. That the effects produced by sulphonal are not always proportional to the dose. 3. That paraldehyde causes less interference with the normal secretions of the body. C. M. Hay (*Amer. Jour. Med. Sci.*, July, '89).

A. B. Cook has found paraldehyde serviceable in asthma, puerperal convulsions, and cough. In spasmodic asthma W. Mackie relieved the spasm by $\frac{1}{2}$ -drachm doses every half-hour for one to three doses. Humphrey has found the drug an excellent remedy in Cheyne-Stokes respiration associated with broncho-pneumonia. With the combined use of caffeine (4 to 8 grains daily) and paraldehyde (30 to 45 drops at night) Cevello found, in cases of œdema, ascites, and pleuritic effusion, that the amount of urine was increased.

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Attention called to antispasmodic action of paraldehyde in asthma. Person-

ally used with good effect in about thirty cases of asthma, including ordinary spasmodic asthma, asthma with epilepsy, with heart disease, or with renal disease, and with chronic bronchitis, and in two cases of asthma with pneumonia. In majority of cases relief was rapid and complete, and in remainder distress was lessened. Dose employed was from 45 to 60 minims, and one dose was usually sufficient; a few patients needed a further dose of from 30 to 45 minims an hour or so later. The drug scents the breath strongly for about twenty-four hours. Addition of a few drops of alcohol renders paraldehyde perfectly miscible with water; any flavoring tincture can be used for this purpose. F. P. Hearder (Brit. Med. Jour., Mar. 21, '96).

In asthma paraldehyde has given most satisfactory results. It is absolutely safe, not only relieving the spasm, but inducing tranquil, refreshing sleep without any objectionable after-effects. As it gives rise to no drug habit, however much its use may be prolonged, it is far more desirable and safe than either morphine or chloral.

A drachm should be used as a dose, and, as the system does not acquire tolerance for the drug, the same quantity will answer as well after months of use as at the beginning. Good way of administering paraldehyde is in expressed oil of almond. Equal parts of the oil and the paraldehyde flavored with essence of cinnamon make a palatable dose. It can likewise be given in water, milk, beer, or wine, by using 1½ ounces or more of these vehicles for each dose of the paraldehyde. A. Macgregor (N. Y. Lancet, p. 127, '99).

Paraldehyde used in purely functional troubles and dyspnoeic conditions arising from various causes, and in many cases complicated with grave organic lesions. In all cases results have been satisfactory. It is perfectly safe to be freely given under almost all circumstances. It is best prescribed mixed with equal parts of syrup of orange-peel and syrup of hemeidesmus, and should always be given freely diluted with water. Mackay (Lancet, Mar. 18, '99).

Paraldehyde may give rise to indigestion and diarrhoea, but is seldom followed by headache or depression. Obstinate ulcers of the nose and cutaneous eruptions have occasionally followed the continued use of this drug.

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PARASITES, DISEASES DUE TO.

Intestinal Parasites.

Parasites which infest the human intestinal tract may be divided into (1) nematodes, or round-worms; (2) trematodes, or sucking-worms; and (3) cestodes, or tape-worms.

Nematodes (Round-worms).—All round-worms occurring as parasites in man belong to the order of *Nematodes*. They have long, slender bodies of simple outline, without segments or appendages. The males are usually smaller than the females. Some nematodes as found in the human intestines are quite harmless, but others are more dangerous; a few pass into more sensitive tissues and organs, producing disturbance or even dangerous injuries.

Ascaris lumbricoides, the common round-worm, is in color a yellowish or reddish brown, cylindrical in shape, and tapering at the ends, somewhat similar in appearance and shape to the earth-worm. The female is from 20 to 40 centimetres in length; the male is smaller and provided on its posterior extremity with the bend like a hook, carrying two projections or processes. The female produces an enormous number of eggs, which, when fully developed, possess a double shell, around which is an albuminous envelope. These are found almost anywhere in the intestinal canal, but chiefly in the smaller intestine, and are very resistant to external influences. These ova mature and de-

velop into the round-worm in the intestine, requiring no intermediate host. They attain sexual maturity in from ten to twelve weeks after the eggs have been swallowed, at which time the length of the female is 20 to 30 centimetres and that of the male 13 to 15 centimetres.

Symptoms.—The presence of the round-worm only rarely produces any symptoms in its host; even then they are often most obscure. In children, however, it sometimes causes a variety of forms of intestinal irritation, which tends to precipitate nervous disturbances. Peiper and others suggest that these nervous symptoms are caused by an irritating toxin, derived from the round-worms. Chauffard, Marie, and Tauchon describe a condition called typholumbricosis as due to this substance. This is a complex of fever, foul breath, and intermittent diarrhœa, which continues for a month or more (Osler), and sometimes is accompanied by prolonged coma (Voucka), or follicular enteritis (Concetti). These parasites, as shown by Thermais, often act as the basis of neurasthenic, hysteriform, epileptiform, and choreiform disorders, and occurring usually in subjects offering no neuropathic antecedents. There can be no doubt of the importance of an examination of the fæces, for ova, in all obscure cases presenting reflex neuroses.

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Some cases of lumbricosis are apt to resemble typhoid fever very strongly. It is considered that the *Ascaris* causes toxic symptoms either by increasing the virulence of the micro-organisms in the intestine or by a poison produced by the parasites. P. Marie (Jour. des. Prat., Nov. 6, '97).

The round-worm occasionally finds its way into normal or abnormal openings in the surface of the intestinal canal, and

thus produces mechanical disturbances. They are sometimes found in the fæces, and are occasionally ejected from the mouth while vomiting. They have also been known to obstruct the common gall-duct, enter the larynx, and in other ways cause more or less grave disturbances.

Treatment.—For the removal of the lumbricoid worms nothing has been found to equal santonin, which, if judiciously used, is almost always satisfactory. It must be borne in mind that very considerable ill effects have followed the excessive or prolonged use of this drug, not only xanthopsia, but hebetude or torpor, and in some instances death. Coppola calls attention to the fact that as a result of the catarrhal condition produced by the parasites a large amount of lactic acid is sometimes found in the intestines which favors the solution of santonin and its consequent absorption. He, therefore, prefers the use of santoninoxim, in double or triple doses, as equally active, but less absorbable and non-toxic. Santoninoxim is a crystallizable body obtained by Cannizaro after subjecting santonin in an alkaline solution to the action of hydroxylamin. The dose of santonin should not be above $\frac{1}{6}$ to $\frac{1}{2}$ grain if frequently repeated, or 1 to $1\frac{1}{2}$ grains a day in children from one to six years (Demmi). A good rule is to give to a child of from two to four years from $\frac{1}{4}$ to $\frac{1}{2}$ grain of santonin along with the same amount of calomel, and after a very light supper composed of $\frac{1}{2}$ glass of milk, each night, for three successive nights. Naphthalin is recommended by Engel: from $\frac{1}{3}$ grain to $1\frac{1}{2}$ grains, four times a day, for three days.

Oxyuris vermicularis, the *seat-worm*, or *thread-worm*, also called the awl-tail, or maggot, is a small round-worm which in man sometimes infects the large intestine and the lower part of the small

intestine. The length of the female is 10 millimetres and pointed at the caudal end like an awl; the male is 4 millimetres in length with a blunt posterior extremity provided with a spiculum. The eggs are brought forth by the female in enormous numbers, and are only developed in the intestinal tract of man or beast. These eggs are very vigorous and offer marked resistance to external agencies.

The most common symptoms of the thread-worm are itching of the anus; this is worse at night, and is accompanied by disturbed sleep and extreme irritability. The irritation resulting from the presence of the parasite may also be the cause of masturbation in both sexes.

Treatment.—In the treatment of thread-worms (*Oxyuris vermicularis*) very little has been offered in recent literature that bears the stamp of novelty. The most important agent is the mechanical and chemical cleansing of the lower bowel and the use of such drugs by the mouth as are known to either paralyze or destroy them. The indications are summed up by Sansom: first, to expel the intruders and all their ova by the use of simple aperients, kept up for several weeks, along with enteroclysis of pure water, which causes the parasites to swell up and burst; second, to prevent the entrance of ova into the digestive tract by the use only of food and drink which have been thoroughly cooked. Preventive measures, among infected children, are of great importance (Nicholson), such as keeping the nails short and clean, dipping them frequently into quassia, and enforcing isolation until a cure is effected. For the intestinal irrigation plain water suffices, if used repeatedly and for a long-enough period, which is daily for a week or two or twice a week for five or six weeks. The in-

fusion of quassia enjoys an especial reputation in this connection, and is the remedy which we have usually used, from three to five irrigations, on consecutive days, usually sufficing; in obstinate cases, where the infection reaches very high up, more may be required.

Solutions of Castile soap are recommended by Monti, continued for from one to three weeks. A. Gremand regards sulphur-water as the most satisfactory, *per clyisma* as well as *per os*. W. N. King recommends a saturated aqueous solution of socotrine aloes, 1 ounce of which is injected into the bowel at bed-time and retained, and this should be repeated for several consecutive nights; it is then discontinued, and, upon a return of the parasite, is again used. Engel recommends a bichloride solution 1 to 2000, but this agent should be most cautiously used.

For internal administration the first item to be considered is diet. The addition of garlic to the food enjoys a very ancient reputation.

Of drugs, the most important are those which act as laxatives, aromatics, and intestinal antiseptics. Sidney Martin recommends a mixture of rhubarb, carbonate of magnesia, and ginger in small doses.

For the relief of the anal pruritus mercurial ointment is useful; it serves the double purpose of soothing the parts and preventing the escape of the worms from the bowel.

It must be borne in mind that frequently the removal of these apparently trifling parasites is attended with the greatest difficulty, especially where there is considerable catarrhal inflammation of the colon. It is most essential in applying the irrigations that they be given thoroughly and in such a way, in obstinate cases, that they reach, if possible, the cæcum. The injection should be

given through a long catheter or rectal tube, which must be cautiously inserted well up beyond the sigmoid flexure, the child lying on its left side, for five minutes, then on its right side for five minutes,—preferably a much greater period.

Trichocephalus dispar, or whip-worm, is an entirely harmless, but quite common, intestinal parasite frequently found in the cæcum.

The size of male and female are similar: from 4 to 5 centimetres in length. The forepart of the body is narrow and the afterpart much thicker, giving it the appearance of a whip. The sexual organs are in the thicker portion, and in the posterior end a spiculum. The eggs are elongated and oval in shape, and 50 millimetres long; they possess a thick, brown shell, at each pole of which is a clear globular mass. They develop slowly and first in water and damp earth, and are very resistant to cold and dryness. The *Trichocephalus* occurs also in the domestic animals.

It rarely, if ever, produces any symptoms, even when occurring in enormous numbers.

Anchylostoma duodenale (*Dochmius duodenalis*, or *Strongylus duodenalis*) is a small worm which inhabits the upper part of the lesser intestine. It is very commonly found among the inhabitants of the tropics, especially in Egypt, and occasionally in other localities.

The female has a cylindroid body of from 5 to 18 millimetres long; the male is from 6 to 10 millimetres. The cephalic end is curved toward the dorsal surface. It is provided with a mouth, very near its extremity, pointing to the ventral side and armed with four incurving teeth on the ventral border and two on the dorsal border, all arranged perpendicularly. This acts as a sucking or biting apparatus by which the parasite fixes itself firmly

on the intestinal surface, from whence it draws out blood for its nourishment. The spots over which the worm has attached itself may be recognized post-mortem as areas of ecchymosis, in the centre of which is seen a white spot showing a central perforation. Occasionally the deeper parts of the mucous coat are penetrated.

The eggs are oval in shape from 44 to 67 millimetres long, and from 23 to 40 millimetres broad. They are similar in appearance to, but smaller than, the eggs of *Ascaris lumbricoides*. The first stages of their cleavage take place in the human intestine, and if these are voided so that other human beings may receive them (which is chiefly through the drinking of muddy water, where they develop still further), they develop into complete sexual maturity in their final host.

Observations of 402 cases of anchylostomiasis at Cairo showed that only 3 belonged to the female sex. Among 200 men, 190 were accustomed to work in more or less damp earth with their hands. The other 10 had various occupations, but 2 of them were earth-eaters. Sandwith (Lancet, June 2, '94).

Symptoms.—Anæmia is the most important symptom of anchylostomiasis, which is also known under the names "Egyptian chlorosis," "miner's cachexia," "mountain or tunnel anæmia," and "brick-makers' anæmia." When a large number of parasites are introduced into the intestine an intense acute anæmia develops, but when only a few are present the symptoms are more chronic. Besides the anæmia, there may be variable appetite, nausea, pain in the epigastrium, constipation or diarrhoea, and hypertrophy and dilatation of the heart, and, in the acute form, dyspnœa and dropsy.

Diagnosis.—The diagnosis is made by finding the eggs in the fæces. These are oval, about 0.05 millimetre long, and

with a thin transparent shell. There is no operculum as in the ovum of the oxyuris.

Treatment.—In the districts in which this disease occurs all drinking-water should be thoroughly boiled and latrines should be systematically employed.

Among drugs, thymol is considered a specific, and, according to Sandwith, should be given in doses of 30 grains in a wafer with 6 $\frac{1}{2}$ drachms of brandy at 8 A.M. and again at 10 A.M. At 12 a dose of castor-oil should follow. The day before and the day after the thymol the patient is to be kept on a diet of milk and soup. This treatment is repeated once or twice until no eggs can be found in the fæces with a microscope.

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The number of cases of progressive pernicious anæmia admitted to Victoria Hospital was 209 in 1892, 277 in 1893, and 272 in 1894. In those attributed to anchylostomiasis 40 grains of thymol in two doses were given, and the following day a light diet and brisk purgation. Of 23 cases thus treated all improved. Since then 60 other cases have undergone the same treatment with the most successful results. Galgey (Brit. Med. Jour., Jan. 23, '97).

Trichina spiralis occurs in two forms: the trichina of the intestines and the trichina of the muscles—phases of their development. Sexual maturity is reached in the intestines, where it appears as a small, white, hair-like worm, the female 3 millimetres in length, the male much smaller, readily visible to the naked eye. In shape it is long and narrow, the intestinal canal beginning with a muscular mouth acting as an intestine. The organ increases in calibre, passes down into the food-canal, and is surrounded throughout its length by a row of large cell-bodies. The eggs develop into em-

bryos within the uterus and are set free at birth.

The embryo, or muscle trichina, which is from 0.6 to 1 millimetre in length, lies coiled up in an ovoid capsule, which is at first translucent, but later becomes opaque and infiltrated with lime-salts.

When trichinous flesh is eaten by man or by certain animals the capsules are digested in the stomach and the trichinæ liberated. Passing into the small intestine they become sexually mature in from two to four days, when they produce innumerable embryos. These embryos leave the intestines for the muscles, the mode of transmission being, according to J. Y. Graham, through the blood-stream. About two weeks after reaching the muscle they attain the larval form. The irritation caused by their presence results in an interstitial myositis and the formation of a fibrous capsule. As a rule, the capsule is occupied by only one worm, but occasionally two or three are seen together. The trichinæ may thus live for years in the muscles. According to Osler, the dissecting-room and post-mortem statistics show that from $\frac{1}{2}$ to 2 per cent. of all bodies contain trichinæ. Of 1000 consecutive autopsies of which he has notes, trichinæ were present in 6 instances. The eating of improperly-cooked pork furnishes the greatest cause of this disease in man.

Symptoms.—If only a small number of trichinæ are swallowed, no symptoms follow; but, in case of a large dose, gastro-intestinal symptoms—consisting of loss of appetite, vomiting, pains in the abdomen, and diarrhœa—develop within a few days. When the embryos begin to invade the muscles, which occurs between the seventh and fourteenth days, there are usually chills and fever. Myositis is present and is characterized by stiffness, tension, and pain on pressure and move-

ment. There may be difficulty in mastication and deglutition, and an intense and distressing dyspnœa may add to the suffering. Œdema, seen early in the face, is noted in almost all the cases. Profuse sweating, miliaria, itching and tingling of the skin, acne, urticaria, furunculosis, and herpes may occur. In protracted cases, especially, anæmia and emaciation are often great. Osler has noticed a marked leucocytosis, which may reach above 30,000, and may prove of value in forming a diagnosis.

Diagnosis.—In addition to the above-mentioned symptoms, the stools may afford important information. They should be examined with a low-power lens, under which the trichinæ appear as small, silvery threads. The diagnosis, when doubtful, may be confirmed by obtaining a piece of muscle from the biceps by a small instrument called an harpoon.

Acute rheumatism sometimes resembles this disease, but the joint swelling in the one and the great increase in the eosinophiles in the other will aid in separating them. Cholera, acute polymyositis, and typhoid fever may also simulate trichiniasis, and must be carefully differentiated.

Prognosis.—The prognosis should be guarded, since it greatly depends upon the number of trichinæ swallowed. A favorable symptom is early diarrhœa.

Treatment.—As a prophylactic measure, thorough cooking should always be insisted upon when pork is utilized as an article of diet.

As soon as it has been discovered that trichinous meat has been eaten, some purgative, of which calomel followed by a saline is the most useful, should be given. Senna, aloin, rhubarb, or glycerin may be tried. For the muscular pains, hot baths and anodyne applications sometimes afford relief, while the bromides

may secure the much-needed sleep. The patient's strength is to be maintained by easily assimilable, nutritious food.

Filaria.—The *Filaria sanguinis hominis* includes a number of varieties, but the three principal ones are the *Filaria sanguinis hominis nocturna*, *Filaria sanguinis hominis diurna*, and the *Filaria perstans*.

The *FILARIA NOCTURNA* is the most common form, the male measuring 83 millimetres in length and the female 155 millimetres. From the lymphatics, where it matures and brings forth its young, it reaches the blood-current. Here it is found only during the night, or, as Stephen Mackenzie has noted, in the daytime when the patient is a day-sleeper.

The embryo, which is about the diameter of a red blood-corpuscle, may be present in the blood-vessels in large numbers without causing any symptoms, but the adult worms or ova are apt to block the lymph-channels, producing lymph-scrotum, elephantiasis, or hæmatochyluria.

The mosquito, by sucking the blood from a person with this disease, is probably connected with the further development of the embryos. It is most likely that some change takes place within the mosquito, which, upon dying, sets free the embryos in some stagnant water where still further development occurs; this, however, has not been proved. Man probably becomes affected through the drinking-water.

Symptoms.—In hæmatochyluria the urine passed is white, opaque, and milky, or sometimes bloody with a sediment consisting of a slightly-reddish clot. The patient may be troubled with this condition only intermittently, normal urine being passed for weeks between the attacks. Fat-granules, red corpuscles, and the embryos in the urine are found mi-

microscopically. Manson attributes some at least of the cases of elephantiasis arabum to the effects of the filariæ.

In LYMPH-SCROTUM, another condition caused by this parasite, the parts are very much swelled and thickened. The lymph-vessels are so distended that they are plainly visible and exude a turbid fluid upon puncture.

Treatment.—When filariasis exists, all drinking-water should be filtered or boiled and kept away from mosquitoes. In cases of chyluria the diet should be dry and devoid of fat. Thymol and methylene-blue have both been claimed by different observers to have given good results.

Manson contends, however, that the attempt to cure filaria chyluria by the administration of a parasiticide is founded on a misconception of the true pathology of this disease and the part played by the filaria in its production. The filaria stands to chyluria very much in the same relation as rheumatic fever stands to heart disease and gonorrhœa to urethral stricture; it starts the pathological process, but its constant presence is not necessary to keep it up. To attempt, therefore, to cure chyluria by trying to kill the filaria is illogical. Once established in the human body, the filaria should be left alone,—protected, rather than persecuted. Pathology indicates that the proper treatment is in principle the same as acquired varix in any inaccessible region. This should be rest, elevation, lowering of the tension in the lymphatic vessels by the use of saline purgatives, limited and appropriate food, and abstinence from fluids as much as possible.

Surgical intervention is sometimes of value in removing the adult filariæ from the enlarged lymph-glands.

Filaria, or Dracunculus, medinensis,—or guinea-worm,—is a thin, thread-like

worm from 60 to 100 centimetres in length, of which the female alone is known. The cephalic end is rounded off, while the caudal end tapers to a point. The external covering consists of a firm cuticle; the uterus filled with young occupies the chief part of the body-cavity. The embryos have no shell, but merely a thick covering, with a pointed tail. These embryos are received into the human stomach through the intermediation of small crustacea and are swallowed through drinking-water. It is frequently found among the inhabitants of Asia and Africa, developing in the skin, occasioning abscesses chiefly in the lower extremities, especially about the heel.

Treatment.—The symptoms produced by the *Dracunculus* are chiefly local and little can be expected from internal medication. Oriental practitioners, however, secure excellent results from the internal use of asafoetida for a week or more; nitrate of potash, in 2-drachm doses in buttermilk, and the use of sugar-candy exclusively is said to cause the death of the worm in one or two days (R. Atmaran).

Local measures and surgical interference are chiefly relied upon by many observers. One of the simplest is the use of cold-water affusion. J. C. H. Peacocke recommends the plan of placing the limb under an interrupted stream of water as soon as the worm has made its external opening in the skin.

The *Eustrongylus gigas* is a rare parasite found occasionally in the pelvis of the human kidney. The female reaches the length of a metre. Several species of the *Dochmius* occur also in dogs and cats and also produce anæmia. Certain varieties of *Strongylus* occur as intestinal parasites or in the lungs, blood-vessels, or other tissues in the domestic animals.

Anguilula stercoralis (or *Pseudorhab-*

ditis stercoralis) is a small nematode found in Italy and Cochin China. In Italy it sometimes co-exists with the *Ancylostomum*, but produces little harm except an occasional diarrhoea. The parasite penetrates the crypts of Lieberkühn, where it deposits its eggs and young, causing disturbances of the epithelium. The size of the male is 0.88 millimetre; of the female, 1.2 millimetres.

Trematodes (Sucking-worms).—The trematodes when fully developed are found, with but few exceptions, in vertebrate animals. The first host is usually a mollusk.

The *DISTOMA HEPATICUM*, or LIVER-LEECH, is a leaf-shaped sucking-worm, 28 millimetres in length and 12 millimetres in width. The eggs are ovoid in shape, 0.13 millimetre in length, and 0.08 millimetre in width, from which an embryo develops in water and attaches itself to a host of the mollusk family. Leuckart says the young of the liver-leech are protected by the limnæa in marshes in the form of radiæ or germ-sacks, in which appear later on germ-granules. From these are developed cercariæ, resembling tadpoles. When these are taken into the digestive tract of ruminant animals, or, as rarely happens, into man, they enter the bile-ducts and sometimes the intestine or inferior vena cava. When these parasites are present in animals,—which sometimes occurs and in great numbers,—the bile-ducts are obstructed, ulcerative strictures or dilatation is produced, bile-concretions are formed, and inflammatory changes are established in adjacent structures or changes produced in the parenchyma or glandular tissues. The endemic fluke disease occurring in Japan is characterized by hepatic enlargement, emaciation, diarrhoea, and, frequently, ascites.

The *DISTOMA LANCEOLATUM* likewise

occupies the biliary passages in sheep and cattle, where it occurs in small numbers and occasions no important changes; if in greater numbers, disturbances are produced in the structures of the liver. It is very rare in man.

The *DISTOMA HÆMATOBIUM*, or BLOOD-FLUKE, is very common among the inhabitants of Egypt, one-fourth of whom are said to suffer from its effects; it also occurs in Zanzibar, Syria, and Sicily. The male is from 12 to 14 millimetres in length; the female, 16 to 19 millimetres in length. They lie, as a rule, in close contact, the female in the *canalis gynæcophorus* of the male. The eggs are of an elongated oval, 0.12 millimetre in length, with a terminal or lateral spine.

Small crustaceans act as the intermediary host into which the ciliated embryo bores its way and becomes capsulated. Infection probably occurs through drinking water containing the larvæ. The parasites are found in the portal vein and its branches, the splenic and mesenteric veins, and in the blood-vessels of the bladder and rectum. The eggs, traversing the mucosa and submucosa, reach at times the liver, lungs, kidneys, as well as the bladder and rectum, giving rise to irritation, ulceration, concretions, and neoplasms. The first and most constant symptom is hæmaturia, which gradually leads to anæmia.

As to treatment, the extract of male fern internally is considered of value by Fouquet.

The *DISTOMA PULMONALE*, or BRONCHIAL FLUKE, is a club-shaped parasite about 8 to 10 millimetres in length. It is found in China, Japan, and Formosa, where, according to Ringer and Manson, it causes an epidemic disease. It is located primarily in the lung, its presence resulting in cough, hæmoptysis, and the

occurrence of small flukes in the expectoration.

Cestodes (Tape-worms).—Cestodes are flat worms about the size and color of a fragment of white tape, devoid of mouth or intestine. They increase by alternate generation, through the germination of a pear-shaped primary host (scolex, or head), and remain attached to it for some time as a long, band-shaped colony. The sexually-active members of this colony, or proglottides, increase in size the farther they are separated from their place of origin, by the formation of new members, but they have no other outward peculiarity.

The pear-shaped primary host (scolex, or head) has from two to four suckers, and is provided also with claw-like curved hooks. By means of these adhering organs the tape-worms fasten themselves to the intestinal wall of their immediate host, which is always one of the vertebrate animals. The scoleces develop from a round embryo with four to six hooks, and are found as so-called "measles," chiefly in parenchymatous organs. Later by means of passive migration they move out of these organs into the intestine of their future host.

Tape-worms which occur as parasites in man belong to different families known as (1) the *tænia* and (2) the *bothriocephali*.

TÆNIA SOLIUM.—When fully developed, this worm is from 2 to 3 metres in length. Its head is spherical, the size of a pin-head, and has permanent sucking-cups. The crown of the head is often pigmented, and has about twenty-six coarse hooks, with short rootlets. Next comes a filiform neck about an inch long. A division into segments commences at a certain distance from the head. The first segments are short, but their length increases from before backward. They are

first square, then longer than they are wide.

The mature segments begin about 130 centimetres behind the head. The sexual organs are fully developed in the earlier segments. The mature segments when stretched are from 9 to 11 millimetres long, and from 6 to 7 millimetres wide, with rounded corners.

The parenchyma of the body of both mature and immature tape-worm segments is divided into two chief layers, viz.: 1. Central, or middle, layer. 2. Peripheral, or cortical, layer.

The middle layer includes the sexual organs, also an excretory apparatus that traverses the whole tape-worm from the head to the last segment in the form of two canals. The canals are connected at the posterior end of each segment and send subdividing branches to the parenchyma.

The sexual apparatus consists of male and female sexual organs lying close together. The germ-preparing organs consist of a double ovary and a single albuminous gland. When the eggs enter the uterus from the globular body in which the first stage of development occurs, the lateral branches sprout forth and become filled with eggs. The eggs in the ovary are pale-yellow, globular cells. In the uterus they become yellowish balls with a thick, opaque shell. This shell frequently has a second envelope, and in it are imbedded nuclei. These thick-shelled balls are no longer eggs, but contain an embryo with six hooklets. While still in the uterus, development of the embryo takes place, and the segments are here impregnated. The further development of the embryo does not take place in the same host which shelters the tape-worm. If the embryos reach the stomach of the pig, the egg-shell becomes dissolved, the embryos are liberated, and

bore their way into the wall of the stomach or intestine. They proceed by way of the blood or active migration into different organs. Having found a lodging-place, the embryo undergoes changes and becomes in two or three months a cyst filled with serum, from whose wall there shoots forth, like a bud, toward the interior a scolex; from this a new tape-worm-head develops, and also a sac enveloping it. The cyst with tape-worm-head is called a "measle," or *Cysticercus cellulosæ*. The scoleces when fully developed possess a circle of hooks, suckers, water-vascular system, and numerous calcareous bodies in their body-parenchyma. If they enter the human stomach, the cyst dissolves, and develops, through formation of segments from their primary host, a new chain of proglottides, a new *Tænia solium*. The *Tænia solium* occupies the small intestine in man, and is acquired by eating uncooked pork.

The "measles" of this parasite occur almost solely in human beings and swine. There is generally only one parasite in the intestine, but there may be more, as many as 30 or 40 having been found in one individual. They cause irritation of the intestinal mucous membrane, colic, and reflex disturbances of the central nervous system.

In the tissues of swine the "measles" are sometimes single, often numerous, and single organs like the heart may be thickly sprinkled with them. In man the cysticerci occur in varied tissues, as the muscles, brain, eyes, skin, etc. In the brain they may appear as a collection of cysts like bunches of grapes, called *cysticercus racemosus*. The cysts are mostly sterile, although some may contain a scolex.

Their importance depends upon their location, but is generally slight, and even

when in the brain does not always cause trouble.

Locally a slight inflammation is excited which causes a thickening of the connective tissue in the vicinity of the cyst. After the death of the scolex the cyst shrivels up, and within it there is a chalk-like mass. In this mass the hooks remain a long time. Infection with the "measles" follows the presence of the eggs, or proglottides, in the human stomach.

TÆNIA MEDIOCANELLATA (OR *SAGINATA*).—This worm surpasses the *Tænia solium* in length, breadth, and thickness, as well as in size of the proglottides. The head is without a circle of hooks, but has a flat crown and four large suckers, which are generally surrounded by a black fringe of pigment. The eggs are similar to those of the *Tænia solium*. The "measles" are found in the cow, chiefly in the muscles and heart, more rarely in other organs, and are smaller than in swine. The development follows a similar course to that of the *Tænia solium*. This worm is more wide-spread than the *Tænia solium*, and human beings acquire it by the consumption of raw beef.

Literature of '96-'97-'98.

Of 1063 cases of tape-worm collected, 402 cases occurred in males. The *Tænia saginata* is by far the most common, the *solium* being much less common, while but 3 cases of *Bothriocephalus latus* have been personally seen in the United States, 1 of *Tænia flavopunctata*, and 1 of *Tænia confusa*. C. W. Stiles (Med. Rec., Oct. 23, '97).

TÆNIA CUCUMERINA (OR *ELLIPTICA*).—This worm is from 15 to 20 centimetres long, and possesses a head and circle of hooks. It occurs frequently in dogs and cats, but seldom in man.

Its cysticerci infect the louse and flea

of the dog. More rarely the flea of human beings.

TÆNIA NANA.—A small tape-worm from 8 to 15 centimetres long. It has a head and four suckers and a circle of hooks and is found in Egypt and Italy.

BOTHRIOCEPHALUS LATUS, OR PIT-HEAD.—This is the most formidable tape-worm of man, and measures 5 to 8 metres in length. It is made up of from 3000 to 4000 short, broad segments. These are broadest in the middle region, and grow narrower toward the end. The length of the largest segment is 3 to 5 millimetres; width, 10 to 12 millimetres.

The head has an elongated oval or club shape. It has on each lateral border a slit-like depression, and is mounted on a filiform neck. The body is thin and flat like a ribbon, except the central parts of the segments, which project outward. At this point the uterus, in the shape of a simple canal, is found. When the eggs collect here in great numbers, the lateral coils of the uterus arrange themselves in knots, producing a rosette-like appearance. The sexual orifices lie in the median line of the ventral surface. The ovary is a double organ, which lies in the middle layer. The testicles consist of clear vesicles lying in the lateral part of the middle layer. The eggs are oval and are surrounded by a thin, brown shell.

The *Bothriocephalus latus* is found in Switzerland, northeastern Europe, Holland, and Japan. Bollinger says it is quite common in Munich. It lives in the small intestine of man. The first development of the eggs takes place in water. Months afterward an embryo develops, armed with hooklets, and covered with minute ciliæ. This develops in an intermediate host into a "measle," which, according to Braun's investigations in the Russian Baltic Sea provinces, seeks out as a mediate host the pike or tadpole, and

either in the muscles or intestines of these fishes develops to a sexless tape-worm. The "measle" of the *Bothriocephalus latus*, according to Grassi and Parona, occurs in Italy in the pike and river-perch. It is found in a Japanese fish, and in a great variety of fishes in the lake of Geneva. It is, however, most frequently found in the tadpole and perch. The "measle" may also be brought to development in the dog or cat.

The presence of the *Bothriocephalus latus* in the intestine of man may give rise to progressive anæmia, resembling pernicious anæmia. How it causes a diminution of the red blood-corpuscles and the percentage of hæmoglobin in the blood is unknown.

Symptoms.—Tape-worms are found in human beings of all ages, but they are by no means common in children. Holt's statistics are very conclusive on this point: of 10,000 cases studied, only 79 gave undoubted evidence of tape-worm. Cestodes may cause no disturbance whatever, and yet occasionally very grave phenomena, such as profound anæmia, malnutrition, and nervous symptoms. When evidences of their presence are discovered, they are liable to produce much anxiety. In nervous folks there follows frequently profound mental depression and hypochondriasis. There is some evidence to show that tæniæ produce convulsions and choreic symptoms, especially in children. The diagnosis need never be difficult, the presence in the stools of segments of the worm and ova can be demonstrated by a careful search, and are readily differentiated.

Treatment.—For the treatment of the intestinal cestodes it is necessary to prepare the patient, who should take a very light diet for two days. A large enema of cold water or a thorough saline purge should be administered in order to pre-

pare as free a passage as possible for the worm. There are a number of remedies advocated, of which the best is, perhaps, pelletierine, but this is not suitable for children and is also very expensive.

For children, most authorities recommend the oleoresin of male fern, four doses of 15 minims each in capsule given at intervals of an hour and followed by an active purge, such as castor-oil. It must be borne in mind that filicic acid dissolves more readily in the presence of castor-oil, and is hence absorbed in greater quantity, causing very considerable constitutional disturbance. Gross (La Méd. Mod., Mar. 20, '95) notes a case of blindness in a man, followed by optic atrophy, thus caused. Two cases, of more or less complete amaurosis, from the use of male fern, have been noted by Mazius (La Sem. Méd., July 3, '95).

For adults the dose of the ethereal extract of male fern is 2 drachms. It is customary to combine *felix mas* with an infusion of pomegranate-root or pumpkin-seeds. Osler recommends an infusion of pomegranate-root, $1\frac{1}{2}$ ounce; pumpkin-seed, 1 ounce; powdered ergot, 1 drachm; and boiling water, 10 ounces. An emulsion of 1 drachm of the ethereal extract of male fern containing 2 minims of croton-oil is then made. After using a low diet on the previous day and an efficient laxative that night, the emulsion and infusion are mixed together and taken, fasting, the next day.

Pumpkin-seeds alone are very efficient. Three or 4 ounces should be carefully bruised and macerated for half a day and the entire amount of the infusion taken and followed in an hour by a purge. Oxide of copper, in doses of $1\frac{1}{2}$ to 3 grains three times a day, for several days, is recommended by Sasse (Med. Week blad, Aug. 14, '98), the only restriction

being the avoidance of acid drinks. A purge is given at the end of a week.

Unless the head is brought away, the segments of the parasite reproduce themselves, and in three or four months show in the fæces. Where the head and neck are protected beneath the valvulæ conniventes, the remedies may not reach the parasite. Unless the worm is killed, it is probable that no degree of peristalsis can dislodge the head. This is especially true of the *Tænia solium*. A good device is to place warm water in the vessel into which the dejecta are received, as it is thus more likely to be preserved entire.

Visceral Cestodes.—The larval forms of certain of the tape-worms invade the solid organs and produce important symptoms. The two varieties which more commonly occur in man are, first, the *Cysticercus cellulosæ*, the larva of the pork tape-worm, or *Tænia solium*; and, second, the echinococcus, the larva of the *Tænia echinococcus*. The *Cysticercus tænia saginata* has been known to occur in man, but is very rare.

CYSTICERCUS CELLULOSÆ. — The ripe ova of the *Tænia solium* are occasionally received into the human stomach, either by being accidentally swallowed or forced into the organ from below. The human then becomes the intermediate host of this cestode, which is usually the *Sus domesticus*. It thence invades various tissues and organs. Pigs are sometimes found swarming with these "measles," and in them there is rarely any constitutional disturbance except possibly at first. If in man only a few of these "measles" become established, the larvæ may die, become calcified, and produce no mischief. They are very rare in America. The symptoms produced where a considerable number occur or where the localities invaded are sensi-

tive are sometimes very serious, and are divided by Osler into: general, cerebro-spinal, and ocular. The *general* symptoms resemble in many instances a peripheral neuritis. When the *cerebro-spinal* tissues are involved, very pronounced symptoms may result, according as the centres are invaded or the more silent regions are occupied. The *ocular* symptoms can be more or less readily elucidated by a direct examination of the eye.

Echinococcic Disease.—This disorder, both general and local in its manifestations, arises from the invasion by the larval forms of the *Tænia echinococcus* of the liver, intestinal canal, lungs and pleuræ, kidneys, bladder, genitalia, brain, spinal cord, bones, heart, and blood-vessels, and occasionally other organs.

In America this disease is extremely uncommon and even then occurs only in foreigners with rarest exceptions. It prevails in countries where man lives in intimate association with dogs, as in Australia, Iceland, and some parts of Europe.

The *Tænia echinococcus* lives in the intestinal canal of the dog. It is 4 millimetres long, and has only four segments, of which the posterior one surpasses in length all the others put together. The hooklets are 30 or 40 in number and have coarse root-processes. Only the cyst-worm is found in man.

The development of the embryo takes place in the stomach or intestine, where the shell of the ovum is digested away; it then burrows through the intestinal wall, arriving at the peritoneal cavity or the muscle; or, falling into the portal circulation, it may be carried to the liver, which, in at least one-half of the cases, is its destination. Again, it may enter the systemic vessels and be carried to various organs and regions of the body.

Upon reaching its destination the six hooklets with which it is originally equipped disappear, and a cyst is formed, presenting two layers: a capsule and an endocyst. These embryonal cysts grow and bud, develop from the parenchymatous layer, and themselves become cysts similar to the first one. Thus, the parent-cyst as it grows may contain a dozen or more daughter-cysts, inside which last again a similar process occurs, and a series of third or granddaughter-cysts in time develop. From the lining membrane brood-capsules arise by budding; these mature into scoleces, which are found to be heads of the *Tænia echinococcus*, presenting four sucking-disks and a circle of hooklets. Should a scolex reach the intestines of a dog, it may develop into a similar tape-worm.

An interesting and important difference between the natural history of the *Tænia solium* and the *Tænia echinococcus* is that the ovum of the former develops into a single larva, whereas that of the latter forms a cyst which amplifies itself enormously and from the lining membrane of which millions of larval echinococci are in turn produced.

In man, as a rule, the growth of the echinococcus is, as described, endogenous, the secondary and tertiary cysts being contained within the primary; in animals, however, the development may be exogenous. The primary cyst penetrates between the layers and matures externally. A third form is the multi-locular echinococcus, occurring in the liver only where the primary cyst-bud develops and is cut off entirely, becoming capsulated. These joining together produce a dense mass composed of connective tissue inclosing spaces in which are found remains of the echinococcic cyst oftentimes sterile: *i.e.*, without heads or larvæ. It resembles cancer, and

the symptoms are those of tumor. The echinococcus lives a varying time, oftentimes many years. The usual change is death and inspissation of the contents and the transformation into a mass of partially-calcified granular material. They may, however, rupture into a serous sac or external perforation, whereupon the cyst is discharged into a bronchus or the urinary passages or the bile-ducts or blood-vessels. From these effects death may follow very suddenly or recovery may ensue. Suppuration may become established, and large abscesses are sometimes formed, which contain hydatid membranes.

Symptoms.—About 50 per cent. of hydatid cysts are found in the liver. When these are of considerable size, the tumor or tumors are detectable by palpation and otherwise, the size of the organ being sometimes markedly increased. When these are small, they may not be distinguished or give rise to any disturbances. When they occur in the epigastric region on the anterior surface of the organ, they can be distinctly appreciated by touch, a feeling of density and occasionally a fluctuation being sometimes elicited. Occasionally they are found near the left suspensory ligament, disturbing the position of the heart upward, and an area of percussion-dullness can be demonstrated in the lower sternal and the left hypochondriac regions. If the tumor occur in the posterior surface of the right lobe, the liver is enlarged upward, encroaching upon the pleura, and the area of dullness in the axillary line is higher. A percussion-fremitus can be detected if the cyst lies very subcutaneously. This consists of a tremulous or vibratory movement conveyed to the fingers of the left hand while percussing at the same time with the right.

Subjective symptoms of pressure or

dragging and occasionally pain are experienced in the region of the liver; little more disturbance is caused than this. Where suppuration occurs, there are the usual symptoms of pyæmia, along with jaundice and rapid emaciation. Perforation may take place externally or into the stomach; colon, pleura, or the bronchi; where this is into the pericardium or inferior vena cava, it is, of course, fatal. To differentiate between hydatid cysts and other tumor-masses it is best to make an exploratory puncture. In some instances hooklets may be found in the fluid, which, as a rule, is clear, of a neutral reaction, and varies from 1005 to 1009 in specific gravity.

The presence of a marked enlargement in the left lobe of the liver, irregular in shape and painless, or in the epigastric region, a smooth fluctuating mass, giving the sensation of an elastic growth, suggests hydatid disease; this is especially the case if, besides, there is hydatid tremor. A syphilitic tumor of the liver is firm and rarely fluctuates. Between hydatid disease and cancer of the liver it is difficult to distinguish except through the clinical history. Hydronephrosis may readily be mistaken for hydatid disease, and can only be distinguished by exploratory puncture. The lung is affected in about one-fifth of the cases, the symptoms being those of pneumonic compression along with displacement of the heart. The pleura is sometimes primarily affected, the signs being those of an ordinary effusion; but the line of dullness is generally quite irregular and there is rarely set up an acute pleurisy. Echinococci of the lung may, when small, cause very little disturbance, but when large the symptoms of compression obtrude themselves; inflammatory changes may be set up, resulting in hæmorrhage. But this is rare.

Treatment. — Medicines administered internally can have little or no effect upon the course of the disorder. When the cyst is large or annoying it must be treated surgically. Aspiration of the contents is harmless, and should be attempted before more radical measures. Recovery, in most instances, follows incision and evacuation of the cysts. Abscess of the liver caused by the echinococcus is obviously a serious disorder. In a large number of cases which come to autopsy the cyst is found to be harmless and the parasite dead.

The kidney is sometimes infested by the echinococci, and symptoms are set up resembling an hydronephrosis. The nervous system is occasionally affected, especially the brain—most frequently the cerebrum. The symptoms are vague, being those of tumor.

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PAROTID GLAND. See PAROTITIS and SALIVARY GLANDS.

PAROTITIS. — Inflammation of the parotid gland. From Gr., *παρωτίς* (*παρα*, vesicle; *οὖς*, the ear), the parotid gland; and *τις*, inflammation.

Definition. — Parotitis is usually an infectious disease (*infectious* parotitis), but it may result from injury (*traumatic* parotitis) or from the extension of inflammatory or malignant processes in adjacent tissues (*irritative* parotitis).

TRAUMATIC PAROTITIS. — Inflammation of the parotid gland may certainly result from injuries of sufficient severity to cause an effusion of blood into the gland or the tissues surrounding it. It may also result from burns or the application of caustics. While micro-organisms may take part in the process, the

condition is quite different from infectious or septic parotitis. Unless infected with septic germs, suppuration is not common.

INFECTIOUS PAROTITIS. — Two forms of parotitis occur as the direct result of germ invasion: 1. Mumps; epidemic parotitis. 2. Metastatic, symptomatic, suppurative, or septic parotitis.

Infectious Parotitis, or Mumps.

Mumps is an acute, infectious, contagious inflammation of one or both parotid glands or other salivary glands, usually occurring epidemically. Although inflammation of the parotid glands may be caused by various germs, the disease commonly known as mumps gives every indication of being a specific disease. A period of incubation, the method of invasion, and the definite course pursued mark the disease as a specific fever. No septic germ, however, has as yet been isolated.

Incubation. — The period of incubation is exceedingly variable. That most commonly observed probably lies between 16 and 20 days. It has been given by different authorities as follows: Flint, 10 to 18 days; Holt, 17 to 20 days; Ashby and Wright, 14 to 21 days; Smith, 19 to 21 days; Jacobi, 2 to 3 weeks; Dukes, 16 to 20 days; Dauchez, 15 days; Roth, 18 days; Henoch, 14 days.

Symptoms. — Premonitory symptoms are usually slight or entirely wanting. In rare cases malaise and headache precede the actual onset for a week. There is frequently a period of invasion lasting from twelve to twenty-four hours, marked by feverishness, headache, muscular pains, anorexia, and perhaps vomiting. In very many cases the local symptoms are the first to appear. Pain is usually the first of these. It is stitch-like in character and is located in the parotid gland, but radiates into the ear

It is increased by pressure and by all movements of the jaw. It increases in severity and in many cases becomes very intense. In other cases spontaneous pain is not felt, it being developed only upon pressure or movements of the jaw. Rilliet describes three painful points: one at the level of the temporo-maxillary articulation; one below the mastoid apophysis; the third over the submaxillary gland. Swelling soon ensues, and first appears in the depression between the mastoid process and the ramus of the jaw, forcing the lobe of the ear outward. At first the parotid gland alone is involved and the swelling assumes the characteristic triangular shape, the upper angle being just in front of the ear. As the surrounding tissues become involved, the triangular shape is lost. The cheeks, side of the neck, and regions behind the ear become swelled, the swelling in some instances extending almost to the shoulder. The tumefaction in front of the ear, however, remains as one of the distinctive marks of parotitis. The swelled area is often reddened, but more commonly the skin is normal in color and appearance. Over the gland the swelling is elastic to the touch, but the surrounding tissues are usually œdematous and have a doughy feeling and may even pit on pressure.

The pharynx and tonsils are frequently involved by the œdema, causing much discomfort. When the disease is unilateral, the head is inclined toward the affected side. When both sides are involved, the head is held rigidly upright, as every movement causes pain. The appearance is characteristic and striking, and in extreme cases the patient becomes almost unrecognizable.

Both sides are usually affected before the attack runs its course. They may be attacked simultaneously, but more fre-

quently the inflammation occurs upon one side a day or two before it appears on the other. Of two hundred and twenty-eight cases reported by Holt, both sides were affected in two hundred and fifteen. The interval is sometimes a week or more, but more commonly it is not more than three days. In unilateral mumps the left side is affected more frequently than the right.

The swelling commonly reaches its height on the third day, it remains stationary for two or three days, and then subsides with greater or less rapidity. The œdema of the surrounding tissues is the first to disappear. After the œdema has gone the gland is sometimes slow to gain its normal dimensions. Seven to ten days are required for the disease to run its course, but the duration of the illness depends also upon the interval between the involvement of the two sides. A patient of my own was confined to the house almost a month. The parotid on the right side was attacked a week after that on the left, and this was followed by orchitis on the eighteenth day.

The other salivary glands are not infrequently involved, and in rare cases the submaxillary glands alone are affected.

The secretion of saliva is usually diminished, but occasionally it is increased. This, together with the painful swelling of the face, œdema of the throat, and constitutional symptoms, renders the patient extremely wretched. Attempts to examine the throat are often futile, the patient being scarcely able to open the mouth. He will make no attempt at mastication and refuse food, owing to the pain during deglutition. These symptoms are especially prominent when the tonsils are involved. Even speaking is then painful. Although the swallowing of acids commonly causes severe pain, it does not always do so, and the popular

belief that it is an infallible sign for mumps is erroneous.

Constitutional symptoms are usually not severe. The fever is rarely high. The temperature ranges in ordinary cases from 100° to 102° F. It frequently does not go above 101° at any time during the attack, but in severe cases it may reach 104° or even more. Other symptoms are those common to all febrile conditions. When the swelling is extreme, pressure upon the vessels of the neck may cause headache and marked cerebral disturbance. Delirium is sometimes due to this cause. The severity of the disease varies greatly in different epidemics. In some the children are but slightly ill; in others they are quite seriously so when the disease is at its height, and are left weak and anæmic.

Diagnosis.—The rapid onset and almost equally rapid subsidence of the glandular enlargement is a most characteristic feature of mumps. This, together with the location of the tumor and its peculiar shape and large size, distinguishes it from acute enlargement of the lymphatic nodes, as well as chronic malignant growths. The location of the tumor is usually sufficient to distinguish it from the cervical swellings of scarlet fever and diphtheria, but examination of the throat should always be made in cases in which there is the slightest doubt.

Etiology.—Although mumps is spread by contagion, susceptibility is probably less than to any of the other contagious diseases. Close contact is usually necessary. The disease is rarely carried from one person to another by a third, but that is known to have occurred. The disease is rare under four years and very few cases in infants have ever been reported. It is rare in adult life and still more so

in old age. It is most common between the ages of five and fourteen.

The period of infection is doubtful. Contagion is possible from the first symptoms or even before the swelling of the glands has appeared. The power of infection seems to continue in some cases for several days after the first symptoms have disappeared. Isolation, to be effective, must be continued for at least a week after the swelling has entirely subsided or nearly three weeks from the first symptoms.

Epidemics of mumps occur more commonly in the fall and spring than at any other season. They vary greatly in frequency of occurrence and the extent of territory involved, occurring in some localities almost annually and in others only at intervals of many years. The infective power of the disease varies decidedly in different epidemics. Epidemics of measles and mumps are frequently associated.

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Micro-organism found by von Leyden in the secretion of the parotid, obtained by catheterization of Stenon's duct, described. The organism is morphologically and culturally characteristic; it is a motile diplococcus, resembling in form, position in cells, and staining properties the gonococcus. It grows on ordinary media, also on ascitic fluid and milk, which lastly is curdled by it. Inoculation of animals, even direct injections into the parotid and the testicle, were unsuccessful. The coccus possesses a very slight virulence. Michaelis (Berliner klin. Woch., Apr. 12, '97).

Bacillus found in the blood and urine of a very severe case of parotitis occurring in an adult. It may be called the "diplobacillus parotitis." In the urine the organism is very much more numerous than in the blood. It is a small, plump rod, rather oval in shape, and about twice as long as it is broad (it is about 1 to 1.5 microns long). It

stains irregularly, the ends staining very deeply, while the centre stains but faintly.

Culture-tubes containing gelatin, agar-agar, blood-serum, and Loeffler's media were inoculated, but as there were no results it would seem that this organism is not capable of artificial cultivation upon the media named. Charles F. Craig (*Yale Med. Jour.*, Apr., '98).

Recurrence of mumps is uncommon, but is not unknown, as my own personal experience has positively demonstrated.

Pathology. — Opportunity for post-mortem study of parotitis is so rare that its pathology is not yet fully understood. So far as known, pathological changes are confined to the salivary glands. Infection probably takes place through the salivary ducts, the gland-substance being first involved. The periglandular tissue is involved secondarily. In those cases in which pathological examinations have been made the salivary ducts have been found to be occluded by swelling and inflammation of their walls. The gland itself is hyperæmic and œdematous. Suppuration is rare and probably does not occur in simple parotitis. Its occasional occurrence is probably due to pyogenic bacteria which have found admission with the specific germs.

Complications and Sequels. — Among young children complications are rare. Suppuration occurs in about 1 per cent. of the cases, according to Holt, and is usually due to some accidental infection by pyogenic germs. Deafness, due not to otitis media, but to disease of the auditory nerve, has been reported in a very few cases. It is usually unilateral and permanent. Facial paralysis, multiple neuritis, and other nervous disorders also occur in very rare instances, and nephritis is not unknown as a sequel.

Two cases of loss of hearing consequent upon attacks of mumps; lesions in both cases believed to be in the laby-

rinth. Rotch (*Boston Med. and Surg. Jour.*, July 31, '90).

Case in which acute inflammation of both lacrymal glands occurred in a patient suffering from epidemic parotitis. Schröder (*Zehender's Klin. Monats. f. Augenh.*, Dec., '91).

Case of acute nephritis, with symptoms of cerebral uræmia, preceding a double orchitis due to mumps. In this case recovery finally took place. Tous-saint (*Archives de Méd. et de Pharm. Milit.*, Oct., '93).

Rheumatism occurs as a complication in 2.8 per cent. of all cases, with or without endocarditis. Catrin (*Gaz. Méd. de Liège*, July 6, '93).

Case of paralysis of the left side following mumps. The complication lasted two years. Chavanis (*La Loire Méd.*, Nov. 15, '91).

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Case in which, directly after an attack of mumps, a boy, aged 7, became paralyzed. Under treatment (hypodermic injections of strychnine, massage, etc.) the boy rapidly improved and was quite well in about six weeks. L. Revilliod (*Rev. Méd. de la Suisse Rom.*, Dec. 20, '96).

In the small proportion of cases that suffer from aural complications the attack usually comes on between the fourth and eighth days, and declares itself by impaired hearing, tinnitus, dizziness, nausea, and, finally, by labyrinthine deafness. The loss of hearing may be absolute. J. L. Minor (*N. Y. Med. Jour.*, Mar. 27, '97).

A most peculiar, but characteristic, complication is orchitis. It is most common in adolescents and adults and is extremely rare in children. Among 230 cases of mumps Rilliet and Barthez saw but 10 cases of orchitis, only 1 being under twelve years. Its frequency undoubtedly varies in different epidemics. The disease is a true orchitis, but epididymitis in rare cases occurs either alone or complicating the orchitis. The disease is, as a rule, unilateral, and occurs

usually between the eighth and sixteenth day of the mumps. A chill at the onset is not uncommon and more or less fever is an accompaniment. The acute symptoms increase somewhat slowly during a period of three to six days, when they subside and the swelling rapidly diminishes. So rapid, in fact, is the return to normal conditions that it is clear that the inflammation does not go beyond the stage of serous exudation. In bilateral orchitis one side precedes the other, as a rule, by one or two days. In many cases, as the orchitis develops the parotitis subsides, which has given rise to the theory of metastasis. In females inflammation of the breast or ovaries occurs in very rare instances. The number of well-authenticated cases of this complication, it must be said, is very small. Involvement of the thyroid gland and of the lymphatic nodes has been observed.

Epidemic occurring at Fort Apache among the soldiers. There were 40 patients and 13 cases of orchitis, with atrophy in 3 cases. Jarvis (*N. Y. Med. Jour.*, May 27, '93).

Series of 699 cases of mumps in which there were 211 cases of orchitis. In 163 of the cases of orchitis atrophy occurred in 103. J. Comby (*Le Prog. Méd.*, Feb. 11, '93).

Statistics of 626 cases of mumps in the garrison of Grenoble from 1890 to 1895. Of these, 184 cases were complicated by orchitis: 133 simple and 51 double. There were 4 cases complicated by endopericarditis, 2 by double pneumonia, 10 by multiple arthralgia, and 2 by serious encephalopathy, but there were no deaths. Trouillet (*Le Dauphiné Méd.*, June, '95).

Prognosis.—Mumps is rarely a serious disease. It usually runs an uneventful course, and under twelve years complications are rare. In children of the so-called scrofulous type resolution is sometimes slow and imperfect. Among 24,635 cases occurring in the army during

the Civil War there were 39 deaths: a mortality so high as to lead to doubt regarding the accuracy of the statistics.

Treatment.—Cases of ordinary severity require but little medication. A mild antiseptic mouth-wash should be given with a view of preventing infection by pyogenic bacteria. The diet should be liquid and the child should be kept in bed if there is fever. Warm camphorated oil is the most soothing application that can be used locally. When there is great tension or throbbing, the ice-bag sometimes gives more relief than warm applications. In general terms, the treatment is the same as for other febrile conditions.

When there is a good deal of pain in parotitis, narcotic applications may be made, or ice applied; iodoform collodion (1 to 8 or 10) may be applied twice daily over the whole surface. Jacobi (*Archives of Ped.*, Feb., '89).

In parotitis affected part is to be enveloped in wadding, the patient put to bed, and, if an adult male, a suspensory applied. If orchitis appears, testicles should be enveloped and lifted toward the abdomen. Hagopoff (*Gaz. des Hôp.*, Sept. 8, '91).

Buccal antiseptics diminishes the chances of testicular complications in parotitis. A 4-per-cent. solution of boric acid (very hot), thymol, or carbolic acid should be employed as a gargle, and pilocarpine subcutaneously in doses of $\frac{1}{6}$ grain once daily, to diminish the pain and lower the temperature in cases of orchitis. Martin (*Revue de Méd.*, Mar. 10, '94).

Literature of '96-'97-'98.

Following ointment recommended for mumps:—

R Ichthyol,

Iodide of lead, of each, 45 grains.

Chloride of ammonium, 30 grains.

Lard, 1 ounce.

This ointment is to be applied to the swelled parts three times a day. In some instances vaselin may be used in

place of the lard, and sometimes belladonna may be added with advantage. Tranchet (*Jour. des Pract.*, May 9, '96).

Symptomatic Parotitis.

This form of parotitis is always secondary and occurs during the course of various acute and septic diseases. It is commonly unilateral and invariably terminates in suppuration. It occurs chiefly in the course of pyæmia, cholera, dysentery, the plague, and in scarlet, typhus, typhoid, and puerperal fevers.

Case of parotitis complicating pneumonia. Theory advanced that it was caused by invasion of Stenon's duct by pneumococci, which rapidly increased and caused inflammation of parotid. This is always a grave form of the disease, almost always suppurating, and prognosis is bad. Duplay (*Le Bull. Méd.*, Jan. 14, '91).

Unilateral parotitis, complicating gastric ulcer in three cases, noticed in the Westminster Hospital during the past six years. Donkin (*Lancet*, Dec. 12, '91).

Two cases of gouty parotitis, the only two met in a large experience among gouty subjects since 1868, at Contrexéville, France. Twelve unpublished cases collected from various French and English authors. Debout d'Estrées (*Univ. Med. Mag.*, Mar., '95).

Efforts at insufflation, such as those required in the use of wind-instruments, like the military trumpet, may cause a relapse of parotitis in persons who have recently suffered from the affection. These relapses may end in a chronic lesion of the parotid gland, which becomes hypertrophied. E. Albert (*Revue de Méd.*, Oct. 10, '95).

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Three cases of parotitis occurring during the course of pelvic disease. Epidemic parotitis was excluded. The first case developed during a pelvic peritonitis. The other two occurred during, or instead of, menstruation. In none did suppuration occur.

In article published by Paget, in 1887, 101 similar cases had been collected.

Parotitis has been reported by Paget and others as accompanying or following pregnancy, delivery and abortion, menstruation (which it sometimes displaces), pelvic cellulitis and hæmatocele, operations on the vagina and uterus, ovariectomy and oöphorectomy, the use of the catheter and sound, blows on the testicle, operations and diseases of the bowel, gastritis and gastric ulcer, disease of the pancreas, and injuries and diseases of the abdominal wall. This varied origin excludes almost absolutely any metabolic theory, and favors a nervous one. W. S. Morrow (*Montreal Med. Jour.*, Mar., '96).

Symptoms.—The onset of secondary parotitis, if it occurs during the course of the disease, is marked by increase of the fever and other constitutional symptoms. If it occurs after the subsidence of the primary disease, the complication is usually ushered in by a chill followed by fever. The location of the swelling is similar to that of mumps. Unlike the latter disease, the gland soon becomes red, hot to the touch, and throbbing. The course of the disease is very rapid, as a rule, fluctuation often being obtained on the fourth or fifth day. Occasionally the process is slow and continues for many days or even weeks. If the abscess is promptly opened, the cavity usually closes and complete recovery takes place. In pyæmia or septic conditions, with abscesses in other regions, a fatal result is very certain to follow.

Pathology.—The process is a suppurative one. The pus may discharge through the cheek or through the external auditory meatus, and more rarely into the mouth, œsophagus, or anterior mediastinum. The abscess may be confined to the parotid gland and its immediate surrounding tissues or it may be so large as to involve the muscles and other soft tissues, and even the periosteum of the bones. The middle ear is not infre-

quently involved, as well as the central meninges. Thrombosis of the jugular and other veins sometimes leads to septicæmia. In rare instances the process terminates in gangrene.

Prognosis.—The result depends largely upon the condition of the patient at the time of the onset of the parotitis. If much reduced by the primary disease, the complication often precipitates a fatal result. If it occurs during convalescence and the patient is not already reduced, a favorable result may be expected. In other words, suppurative parotitis in itself is not usually fatal. Induration and enlargement of the glands is a common result.

Treatment.—By introducing a probe into Stenon's duct at the first appearance of swelling and making pressure from the outside, a small quantity of pus may sometimes be evacuated and general supuration prevented. If this fails, poultices should be applied to hasten supuration. An incision should be made, with antiseptic precautions, as soon as fluctuation can be detected. The treatment throughout should be that appropriate for any acute abscess.

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PARTURITION, ABNORMAL.

The value of a careful examination, both general and local, of a pregnant woman cannot be overestimated. The mortality-rate of parturition has been diminished during the last ten years, but it still continues high mainly because a thorough examination of the patient months before the expected event is neglected. As a result, the accoucheur is not prepared, until the labor sets in, to treat that which might have been avoided or checked by prophylactic measures.

Again, a careful estimation of the size and conformation of the maternal pelvis, thus ascertaining whether or not there is a disproportion between the bony structures and foetal head, is the secret of success in a large number of cases. The recognizable causes of abnormal parturition may be *maternal* or *fœtal*.

Maternal Causes of Abnormal Parturition.

These may be subdivided into general and local predisposing factors. Any constitutional vice, whether acute or chronic, predisposes to either primary or secondary uterine inertia, and thus causes dystocia. Tuberculosis, organic heart disease, malaria, acute diseases,—such as pneumonia, nephritis,—with the possibility of eclampsia, represent the *general* maternal causes most frequently encountered. The *local* maternal causes are of even greater importance, and consist of tumors, uterine or extra-uterine; pelvic deformities, including bony tumors, generally-contracted and flat rachitic pelvis, simple flat pelvis, and irregular pelvis; spasm or rigidity of cervix or abnormalities or tumors; uterine malformations, either natural or acquired; hæmatoma of the genital tract; spasm, rigidity, or abnormality of the vulva or perineum; full bladder or rectum; and placenta prævia.

TUMORS.—Fibroid of the uterus so frequently occurs as a complication of pregnancy that the condition is often considered as of no importance. So long as the growth does not obstruct the pelvic inlet it gives rise to no trouble except possibly to predispose to hæmorrhage in the third stage of labor. Fortunately, fibroids are mostly situated at the fundus and are out of harm's way; or, being pedunculated, even though encroaching so as to materially interfere with labor by occluding or narrow-

ing the pelvic inlet, in most cases they can be pushed up beyond the presenting part. The difficult cases are those in which large growths springing from the lower uterine wall or intraligamentous fibromata form an insurmountable barrier to delivery.

The next most frequent obstructive tumor is the ovarian cystoma. Peculiar as it may seem, small growths are more apt to cause dystocia than the greater ones. While patients with enormous cystomata rarely become pregnant, if this obtains, the cyst is usually pushed out of harm's way. The smaller varieties—dermoids, for instance—are likely to become incarcerated and so wedged in the *cul-de-sac* as to make the possibility of terminating labor by the ordinary passage practically impossible. Again, the possibility of rupture of such a tumor is not a remote probability.

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In the treatment of ovarian tumor obstructing labor, the tumor should be pushed out of the pelvis if possible. Cæsarean section will very rarely be necessary if the tumor be withdrawn from the pelvis. Abdominal ovariectomy is the safer operation, and should be preferred to vaginal ovariectomy. Spencer (Trans. of the Obstet. Soc. of London, vol. xl, pt. 1, '98).

Carcinoma is a somewhat rare condition. Early in the course of the affection the complication is not an alarming one, since the first stage of labor is rarely influenced. It is only during the ulcerative stage that the hæmorrhages, sloughing, etc., make the complication a very trying one.

PELVIC DEFORMITIES. — Pelvic deformities are comparatively rare in this country. Relative pelvic contraction,—*i.e.*, a pelvis of average size which is yet too small to admit of the passage of an

overlarge child,—however, is common enough. In truth, there is no pelvis, except one very much contracted in one or all diameters, which cannot act naturally and without assistance as the passage-way for the fœtus. A pelvis can only be said to be contracted when a particular head cannot adapt itself to that particular pelvis. This cannot be measured; it can only be estimated. A good rule in midwifery is the following: Any head, no matter how large, which can adapt or engage itself in a pelvis, no matter how small, can safely pass through the pelvis. The only exception is the funnel-shaped pelvis, which is so exceedingly rare that its occurrence need hardly be taken into consideration. A pelvis with normal or supernormal measurements can be as contracted for the passage of a large unyielding head and cause the same interference as a pelvis whose size is estimated as small or much below the normal; or, on the other hand, a very decided degree of pelvic contraction or distortion is no barrier to the passage of a sufficiently small child at term.

[This statement has but too often been verified in cases where Cæsarean section seemed to have been indicated. All preparations having been made for its performance, the child, though undersized, but at full term, quietly slips into the world, much to the surprise of the operator, who has to content himself with sewing up the perineum. S. MARX.]

In a series of 95 cases of kyphotic pelvis, 30 per cent. of which were universally contracted, three-fourths of the cases terminated by spontaneous labor, one-fourth prematurely. Klein (Archiv f. Gynäk., B. 50, H. 1, '95).

Series of 60 cases of labor in various forms of contracted pelvis in which 25 cases were delivered spontaneously. Guéniot (Bull. et Mém. de la Soc. d'Obstet. et de Gynéc., Apr. 18, '95).

Records of 6000 cases of pregnancy

summarized in which contraction of the pelvis was noted in 654,—10%₁₀. Comparison of the measurements of the head, weight, and length of the child with the measurements of the pelvis gave no definite results. In 87 per cent. (563 of the 654) delivery was spontaneous. In all of these cases the contraction was slight, the true conjugate being three and one-half to three and one-third inches. Austin Flint, Jr. (Med. Rec., Oct. 26, '95).

The *unknown* elements in all these cases are, first, the size of the child's head and its condition, and, second, the force and vigor of the uterine action. To measure the size of the unborn foetal head even at the present day, we must rely solely upon an estimate obtained by external means, including the adaptability of the head to its own particular passage-way. Yet the pelvimeter and pelvimetry afford a degree of information that it is not our intention to overlook. Thus, narrowing of one or more of the pelvic diameters should always make us suspicious and apprehensive as to the outcome and inspire unusual care in watching the progress of such a case. But never because of a pelvic contraction, except possibly where the history of prior difficult and dangerous labors is obtainable months before the advent of labor, should the patient be advised to elect any operation, until the size of the foetal head, as compared to the size of the maternal pelvis, is ascertainable.

[In doubtful cases, in view of the safety of anæsthesia, examination under ether should be the rule, for then the hand in the vagina may estimate the capacity of the pelvis and the adaptability of the presenting part. E. H. GRANDIN.]

The generally-contracted pelvis is the most frequent form and is more apt to give rise to difficult labor than either the simple flat or the flat rachitic pelvis, because of the narrowing in all diameters

and the absence of a compensatory enlargement. Where compensatory enlargement occurs in one or another of the diameters, Nature seems to find this wider path to force the well-flexed head through, and studiously avoids the narrowest, most frequently the antero-posterior or oblique, the transverse, as a rule, being the compensatory diameter.

Accounts of 196 labors in cases of kyphotic pelvis in 113 women. Of these, 126 were full-time, normal labors; 14 were premature (3 being abortions); in the remaining no history was given as to the time of delivery. Of the 113 women 46 died,—14 after Porro or Cæsarean section, 2 died undelivered. Neugebauer (Monats. f. Geburts. u. Gynäk., B. 1, H. 4, '95).

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Critical review of the first thousand patients delivered in the obstetrical department of the Johns Hopkins Hospital: In 131 cases of contracted pelvis there was necessity for operative delivery 46 times, or 35.11 per cent. The pelvis most frequently requiring operation are the rachitic and the irregular forms. The generally-contracted pelvis, though very common in the negro race, is comparatively rarely sufficiently deformed to seriously obstruct labor. On the other hand, the pelvis possessing a medium degree of contraction are the most perplexing, and call for the exercise of the greater skill and judgment. G. W. Dobbin (Obstetrics, Aug., '99).

SPASM OR RIGIDITY OR OTHER ABNORMALITIES OF THE CERVIX.—These are potent and frequent causes of dystocia, their tendency being to very materially prolong the first stage of labor. The spasm of the cervix may be due to reflex conditions, such as malpositions of the foetus, but a most frequent cause is a general neurotic state of the patient. The pains existing are very severe and lasting, while no material progress takes place in the cervical dilatation.

The diagnosis is positive if, on examination, the edges of the os are found very rigid, but thin, having a razor-like edge, very hot, extremely painful, and tightly hugging the head.

Rigidity of the cervix is, as a rule, the result of previous cervical lacerations or of a prior existing chronic cervical endometritis, both conditions producing more or less marked cicatrizations of the cervix. In old cases the cervix is sometimes as hard as iron.

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Atresia of the cervix in labor is in all cases due to inflammation of the cervix, which, in the early stages of pregnancy, leads to adhesion of the granulating surfaces of the cervical canal. When labor begins, the upper part of the cervix yields and thins out, while the lower portion remains undilated, and the os is not to be discovered by digital examination. As labor advances the cervix descends, and finally appears at the vulva or even protrudes beyond the orifice in the form of a dark-red, thick-walled, fluctuating tumor, which becomes tense with every pain. The os is concealed by the perineum, and is to be sought for on the posterior aspect of the presenting mass. It may be median or to one or the other side of the middle line. When detected, its position is indicated by a small circle of brighter hue than the rest of the surface. The treatment consists in scratching with the finger-nail and then dilating with the finger. Rupture of the membranes should in all cases be delayed as long as possible. Campbell (*Brit. Med. Jour.*, Oct. 23, '97).

MALFORMATIONS OF THE UTERUS.—Bicornate uterus and other congenital malformations, as well as acquired states of the vagina, give, as a rule, very little trouble during labor, since the patient either aborts early or, if pregnancy advances to full term, Nature takes care of the malformations.

Occasionally a congenitally-deformed

uterus ruptures at term, but this complication is rather as much an accident as though it occurred in a normal uterus.

Pathologically-deflected uteri, the result of a prior existing pelvic peritonitis, are seldom causes of dystocia at term. If the pathological condition is extreme, these patients seldom become pregnant normally, and are more likely to be the victims of an ectopic pregnancy. If the adhesions which bind the uterus in a false position are not too old, the growing uterus will stretch them sufficiently to allow that organ to assume its normal position. If not, abortion is the usual result.

[In instances of this nature, the woman being exceedingly anxious for offspring, the possibility of avoiding abortion by operative separation of the adhesions is justifiable in view of the slight risk. E. H. GRANDIN.]

TUMORS OF THE LOWER GENITAL TRACT, including hæmatoma, are rare complications, and yet when they do occur produce very alarming conditions. S. Marx has, on two occasions, been compelled to perforate in the presence of enormous vagino-vulvar hæmatomata, which absolutely prohibited any one form of delivery. The pathological entities under this heading produce more or less narrowing of either the cavity or the outlet of the pelvis.

SPASM, RIGIDITY, OR OTHER ABNORMALITY OF THE VULVA OR PERINEUM.—Predisposition to these conditions attends those that are too young, in whom the parts are undeveloped and unyielding, or, on the other hand, those in whom spastic contractions of the sphincter ani exist. They are also apt to occur in women who conceive late in life, whose genital tract is hard, cartilaginous, and resisting. In another class, in which previous lacerations give rise to firm cicatrices, an almost absolute barrier is

offered, which can only be overcome by radical measures.

[In a case lately seen by the undersigned the head was *in situ* at the vulva for twenty-three hours before forceps delivery was undertaken. There followed the most extensive gangrene and sloughing of vulva and perineum as is possible to imagine. S. MARX.]

FULL BLADDER AND RECTUM.—This constitutes one of the most prolific causes of difficult and prolonged labors. One would suppose that a normal bladder would functionate spontaneously, but this is not the case. By disturbing the axial relation between fœtus and pelvis, owing to displacement of the uterus by an overdistended viscus, grave and marked symptoms arise. These, however, can be readily arrested, as soon as the cause is discovered. With equal force can an overdistended colon and clogged rectum produce the same disturbance.

Fœtal Causes of Abnormal Parturition.

When we consider that the fœtus causes dystocia either by being oversized or by presenting itself in a vicious position, our lines of treatment are very materially simplified. Here, again, a large unyielding head attempting to pass through what is usually considered a normal pelvis produces such disproportion between head and pelvis that the latter must be considered contracted so far as that particular head is concerned. If the head is unusually large or refuses to mold, we may be confronted with a condition which would warrant us in seriously considering a major operation in order to effect delivery. This same statement holds equally good in an unrecognized vicious position of fœtus. The fœtal causes of dystocia may be enumerated as follows: Too large a fœtus, including partus serotinus; pre-

maturity; multiple pregnancy; monsters; hydramnios — oligohydramnios; adhesion of membrane or decidua; thick membranes; malposition; malpresentation.

ABNORMALLY LARGE OR SMALL FŒTUS.—A fœtus which is oversized has a decided influence in causing dystocia. The subject has been referred to elsewhere in this article. True partus serotinus is rare, but it undoubtedly does occasionally occur. Here the pregnancy is prolonged, the woman even carrying the fœtus as long as 11 months. This is verified by the unusual size of the child, the long hair, and the long, firm finger-nails. Too small a fœtus or one that is premature gives rise to complications, because it has a tendency to assume a vicious position.

MULTIPLE PREGNANCY.—Multiple pregnancy, because of overdistension of the uterus or again because malpositions in this case are the rule, is a frequent source of difficult labors.

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In twin labors, as the first child is born the second should be immediately extracted by the feet. In this way the mortality for mothers and children will be rendered as small as possible. Stephenson (Scottish Med. and Surg. Jour., Nos. 1 and 3, '97).

MONSTERS.—Hydrocephalus, joined twins, congenital tumor, anacephalic monsters, either because of their size or their tendency to present pathologically, are nearly always the cause of difficult labors.

HYDRAMNIOS.—Hydramnios, by overdistension, acts similarly to multiple pregnancy, while the opposite condition, oligohydramnios, is nearly always associated with grave malformation of the fœtus. This, with the absence of the water-wedge to dilate the os, usually produces a very prolonged first stage.

ADHESION OF THE MEMBRANES or persistence of the decidua in the neighborhood of the internal os or very thick and resisting membranes, the result of a chronic deciduitis, is a causal factor which can produce as much trouble as an occlusion of the external os. Indeed, it often simulates the latter condition. Unless recognized and measures be taken to overcome the occlusion, it is not impossible for a uterine rupture to occur.

MALPOSITION AND MALPRESENTATION.—Under this subdivision we have the most prolific causes of dystocia. The great danger lies solely in the fact that when a malposition more than a malpresentation occurs it is seldom recognized. We refer especially to occipito-posterior positions, than which no more troublesome complication arises. We emphasize the fact that a malposition of a normal presentation is possible. Similar malpositions would include chin-posterior cases and brow cases. The fault in the non-recognition of these cases always rests with the physician. Most examinations are perfunctory; the attendant rests satisfied so long as he feels the round bony head, whether engaged or non-engaged.

Characteristic of all vicious positions are early rupture of membranes, slight nagging pains, and slow or absent engagement of head. Non-engagement of the foetal head always means either a malposition or a relative or absolute pelvic contraction; in short, a pathological condition. The *accoucheur* might possibly err in failing to find a pelvic distortion or contraction; he must never fail, however, to clear up a malposition. If this is not possible by the ordinary means, he must insist upon the introduction of the whole *aseptic* hand into the uterus to clear up the condition, although this requires anæsthesia. It

is evident, reasoning from practical experience, that, since contracted pelves in this country are rare, the most frequent causes of dystocia can be ascribed to malpositions and malpresentations. Early recognition and timely interference as the case demands, operating then and there only when the indications present, is here the secret of absolute success.

Out of 400 cases of occipito-posterior positions collected, spontaneous rotation forward occurred in 353.

In failure of rotation the hand was introduced to dislodge the occiput from the sacrum, and, when further rotation was required, Tarnier's forceps was found especially useful. Maternal mortality, 0.5 per cent.; of 660 contrasted cases of occipito-anterior position, 0.46 per cent. Fœtal mortality in occipito-posterior position, 2 per cent.; in anterior position, 0.76 per cent. It was found necessary to apply the forceps at the pelvic inlet in 6 per cent. more cases than in anterior positions. Bataillard (*Annales de Gynéc. et d'Obstet.*, Aug., '89).

Treatment.

Prophylactic Measures.—We must presuppose that the pregnant woman has been very carefully examined in advance from a physical stand-point and every constitutional abnormality noted, and that any disease of an organic nature discovered has been so treated as to avoid complicating factors. It is assumed that every means has been utilized to place the patient in the best possible position to help her to safely pass through the trying hours of pregnancy and labor. To fail in methodically examining the urine and to obtain a careful estimate of the excretion of urea in twenty-four hours might prove a fatal dereliction. This should be repeated every two weeks. Albumin means very little, more of a danger-signal than any-

thing else; on the other hand, patients sometimes die of eclampsia without the faintest trace of albumin in the urine. It is the urea or its derivatives and toxins of uncertain nature that kill, not the albumin. *It is when the amount of urea diminishes that the accoucheur should look out for storm, even though no albumin be present.* Rest in bed, milk, actively stimulating all the emunctories, and, in the event of their failing, deliberate induction of labor are indicated. In women of flabby build with considerable adiposis, in whom we suspect a fatty degeneration of the uterine muscle, good results are claimed for the continuous use of small doses of strychnine throughout pregnancy or small doses of quinine for their salutary effect in stimulating the uterine muscles.

It sometimes happens that a woman will go from one pregnancy to another, always losing the child either artificially by instrumentation or from the results of a prolonged labor, in whom, while the pelvis is normal, the children are all very large. This constitutes a pelvis which is relatively contracted. Much can be done to reduce the size of the child by appropriate treatment, either medical or dietetic.

[I think I have gotten at least questionable results by exhibiting small doses of thyroid extract from the sixth month of pregnancy. In these cases the child showed marked torpidity in its movements *in utero*, and was somewhat below the usual size and weight as compared to the children the mothers had had at previous accouchements. S. MARX.]

Much can be done by the so-called Trochowonick dietetics from the sixth month of pregnancy: forbidding sweets, pastries, fats; ordering regular exercise, and limiting the diet to meats, green vegetables, acids, and stewed non-sweetened fruits.

Under prophylaxis we must call attention to pelvimetry. We never measure a patient's pelvis for the sole purpose of fixing the time in advance for the termination of labor, unless the pelvic distortion be so extreme as to warrant immediate interference, or justifies an abdominal section at term. We always estimate the size of the pelvis as compared to the size of the head; and when the time comes when by suprapubic pressure we find the head fits snugly or fails to engage, be this at the seventh, eighth, or ninth month,—providing the patient does not insist on a Cæsarean section at term,—we proceed at once and induce labor. We never tell a patient that because of a pelvic contraction she must have labor induced at the sixth month. We perform the suprapubic manipulation once in two weeks during the last three months of pregnancy, and an attempt is made to get the head engaged into the pelvis. When this fails, labor is induced.

Curative Treatment.—The curative treatment may be divided into: (1) medical; (2) postural; and (3) surgical, the latter affecting both mother and fœtus.

The MEDICAL TREATMENT of dystocia resolves itself into the treatment of prolonged first stage. There are a number of valuable drugs that can be earnestly recommended in the abnormal dilatation of the first stage. It is, of course, of the greatest importance to ascertain the cause, if possible, of the condition. This once removed, the labor will in all probability be rapidly terminated. Evacuation of the bladder and colon, the careful and thorough examination of the presenting part to discover, if possible, a malposition, even to the extent of introducing the full hand *in utero*, will materially assist the treatment. We have in the sedative drugs—viburnum

prunifolium; opium and its derivatives, as morphine and codeine—very valuable agents in a certain class of cases.

When the pains are weak, irregular, nagging and exhausting, they assume the character of the so-called “false” pains and may last several days; while there is no appreciable effect on the cervix, the patient is gradually, but surely, being worn out. Here the administration of viburnum, 1-drachm doses every hour, or codeine is indicated. Morphine is objectionable since the after-feeling and its inhibitory action on all the emunctories are very disagreeable features. More valuable than any other drug is chloral in 10-grain doses, administered hourly till the patient experiences relief.

In quinine we have a most wonderful agent in connection with the parturient uterus. Indications for its use are very pronounced in cases in which the pains are regular, though weak. Such pains have no influence on the progress of labors. They simply represent weak physiological uterine contractions. They can be wonderfully stimulated by quinine in full doses, 20 grains by the mouth or 40 grains per rectum. Quinine does not act like ergot, which ought never to be used before or during parturition. Ergot causes permanent spastic uterine action, no alternate contraction and relaxation, while quinine influences the uterine pains by intensifying them and causing regular firm contractions and complete relaxations. Of course, its administration is limited to the first stage of labor, dystocia in the second stage being always amenable to manual or instrumental interference. Strychnine acts similarly to quinine, but is not nearly as efficacious.

A third set of drugs which can be called sedative and antispasmodic are

gelsemium in the form of the tincture, chloral, chloroform, and ether, and, locally, hot water. In cases of labor, occurring especially in young neurotic, weakly women, the following classical picture is often presented: The pains are hard and trying from the beginning; while regular enough, they partake more of the character of a local spasm. The woman cannot control herself and throws herself about restlessly. She calls for assistance and is soon exhausted. Locally there is revealed an os admitting one or two fingers, even after many hours of suffering. The head is closely pressed against the lower zone. The rim of the os is hot, painful, and tender and its edges feel extremely tense and sharp. Such a finding warrants the administration of one or other of the above drugs. Chloral in 15-grain doses every fifteen minutes, four times, or the administration of chloroform from drop doses during a pain to anæsthesia of the obstetrical degree, with or without continuous local irrigation of sterile and very hot water, work wonderfully. They cause the spasm to disappear, the os to rapidly dilate, and place the patient in a condition in which at least the pain is bearable. Ether is not of as great value as chloroform, since experience has shown that it does not relax spasm as readily as the latter. Adjuvant measures to be thought of are mustard paste to the small of the back and firm pressure against this part by hand or pillow.

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The use of a 10-per-cent. solution of cocaine is advocated for rigid undilatable os uteri. In five cases, all primiparae, from nineteen to forty years old, it was used with unvarying success, and dilatation was always secured in a very few minutes. The solution is rubbed over the external and internal surfaces of the

cervix, and the cotton is allowed to remain in contact with the os for a few minutes. Farrar (Brit. Med. Jour., Sept. 17, '98).

THE POSTURAL TREATMENT has been little recognized, and consequently few obstetricians use it in their methods of treatment. In practice the various positions offer most valuable assistance. They are divided into (1) the right and left lateral position, (2) the knee-chest, (3) exaggerated lithotomy, (4) the Walcher, and (5) the Trendelenburg.

The *lateral postures*, right and left, are of signal service in posterior position of the anatomical head, or in anterior positions in which by turning the patient on the side the pains are intensified. Their rationale is not clear, but the supposition is that they overcome the extreme uterine obliquity present in these cases, causing the fœtal spine to be straightened and consequently to become more rigid. This makes it possible to carry the force of the contraction directly along practically a straight line, in this way influencing and increasing flexion or extension of the head, according to whether the vertex or face presents. In these cases the patient is turned on that side corresponding to the position of the presenting part, in R. O. P. vertex cases on the right side, or, again, L. P. face on the left side. In a majority of these malpositions speedy rotation occurs as a result of these manœuvres.

The *knee-chest position* has been recommended by many as a manipulative position for purposes of operation. It is claimed that versions can be more readily done and that a prolapsed cord will of its own weight fall back into the uterus. This we have never been able to confirm. In performing versions in this position our experience has shown that not alone the fœtus, but the whole

uterus, is drawn much too far away by force of its own gravity to make the operation easy or satisfactory. In prolapsus funi a deliberate version is far more preferable to measures such as this or others which at best are uncertain and not reliable.

The *exaggerated lithotomy* and the *Walcher positions* are hyperflexions of the lower trunk and legs in the first named, and exaggerated extension of the same in the last named. The lithotomy position is the usual position for delivery in this country. By assuming this decubitus, the pelvic outlet is materially enlarged in all its diameters, at the expense of the pelvic inlet. Its rationale is the reverse of the Walcher, which will be more fully explained below. Indications for this position would hold only in contractions at the outlet or for the purpose of increasing the diameters in normal cases. This would obtain in cases in which the head remains fixed for many hours at the outlet, owing to an apparent or real minor contraction of that part, possibly as a result of a pseudomaskuline type of pelvis.

In the Walcher position we have a really valuable source of assistance. By hyperextension of the trunk, the buttocks overhanging the table and the feet swinging free over the floor, the patient being held in place by roller sheets passing under the armpits, there occurs an increase in the size of the diameter of the pelvic inlet of from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch, at the expense of the pelvic outlet. This increase in the conjugata vera is primarily due to a rotation of the ilio-femoral joints. This pushes the sacrum at the sacro-iliac joint backward, because of the laxity of the posterior ligaments. The axis of the pelvic brim presents downward at an angle of about 40° .

This position is indicated in minor

pelvic contractions when the head fails to engage. The patient may be placed in this position and left there for some time till the head engages. In versions for minor contractions as the head passes the pelvic inlet it is of great service. But it must be remembered that the enlargement is always at the expense of the outlet, and, as the presenting part passes the obstruction, the patient must be thrown into the exaggerated lithotomy position to enlarge the pelvic outlet. The great value of the Walcher position lies in the fact that it has very materially limited the field for the operation of symphysiotomy, not to mention the positive increase in size obtained at the pelvic inlet.

Walcher's position employed at the Dresden Maternity Hospital in 21 cases. Pelvic contraction was present in each instance,—mainly, of the flat rachitic variety, the conjugate diameters varying from six and a half to nine centimetres. Excellent results followed the employment of this position in 18 of the cases: in 10 of these, notwithstanding the increase in the diameter, a spontaneous delivery was even yet impossible. The increase varied from one-half to one and a half centimetres in nearly each case. The accuracy of this observation was verified by measuring the diameters of the foetal head, which in many instances considerably exceeded the diameters of the pelvic inlet. As is usual under these circumstances, the uterine pains were feeble and irregular, but as soon as Walcher's position was adopted they became stronger and more regular. Walcher's position is of service only if the foetal head is still free and movable above the pelvic brim, or has only entered the inlet with but a small portion of its diameter. Huppert (*Archiv f. Gynäk.*, B. 56, H. 1).

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Walcher's position is indicated in:—

1. Cases of protracted labor in which the dimensions of the pelvis are normal

or the antero-posterior diameter is somewhat shortened, the head being above the brim. The patient being placed in the position of extreme extension for an hour or more, the pelvic joints may become so relaxed or the antero-posterior diameter lengthened by the necessary half-inch, that the head will engage and labor be terminated normally or with forceps. The high forceps operation, version, or symphysiotomy are thus avoided.

2. Cases in which version, either cephalic or podalic, has been performed, or footling or breech cases. The flat pelvis, the generally-contracted pelvis, transverse positions, and occipito-posterior positions are in this category.

3. Cases in which some form of operative procedure has already been adopted without success. It has thus far been used after high forceps operations, version, symphysiotomy, craniotomy, and low forceps, and it will probably be shown to have a still more extensive field. A. F. Currier (*Med. Rec.*, Feb. 8, '96).

The *Trendelenburg posture* is of great value as a position for the total extirpation of the pregnant uterus or in acute collapse after labor. It has been advocated for versions and in the treatment of prolapsed cord. An ironing-board, or a reversed chair will answer every purpose for this position, the patient being fastened by rolled sheets.

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In obstetric operations a combination of Trendelenburg and Walcher positions recommended. It is suitable for high forceps, version, high manual internal rotation for occipito-posterior position, reposition of cord, etc. The combined position is effected as follows: In maternities the patient is placed on the Trendelenburg incline, and slid upward till she balances on her sacrum, the legs hanging over. In private practice a plain wooden chair with a flat back, and no rungs between the rear legs, will serve the purpose. The chair is placed on its

face across the foot of the bed, the back forming the incline for the Trendelenburg position. A blanket or double sheet is laid along the chair-back and may fall over the chair-bottom. The patient, when anesthetized, is placed on the inclined plane in such a manner that the buttocks rest on the upturned back edge of the chair-seat, and that they project a little beyond the chair-seat toward the operator, so as to give him unimpeded access to the vagina between the rear chair-legs. The patient is held in this position by means of a sheet twisted into a rope, and passing behind her neck and in front of the shoulders, while the two ends are made fast to the rear legs of the chair. Each knee is then grasped, and the legs swung outward until the thighs hang outside of the upturned chair-legs. The weight of the lower limbs causes them to drop toward the floor, with the knee lower than the hip.

The combination of the Trendelenburg with the Walcher posture levels the birth-canal, and does away with the necessity of the operator's sitting on the floor or working from beneath in a most uncomfortable position. Dickinson (*Amer. Jour. of Obstet.*, Dec., '98).

Surgical Treatment.—**SURGICAL MEASURES INDICATED IN MATERNAL IMPEDIMENTS TO LABOR.**—As minor surgical measures to influence tardy pains, we have but to mention, for purposes of completeness, the use of Barnes's bags and the elastic bougie. The bougie is indicated in cases in which the pains, on the one hand, are tardy and inefficient, while Barnes's bags are to be used when for some reason or other the cervix fails to dilate and there is a distinct indication for an early termination of the labor. We have in our modern manual dilatation of the os, however, a surer, safer, cleaner, and more scientific method than the two mentioned. By successive introduction of one finger after another into the lower uterine zone, we have, with few excep-

tions, been able to dilate the os, sufficiently, at least, for the purpose of delivering the child. This method has for the last five years been our method of election, not alone in tardy first stage, but in the induction of premature labor. The results have been almost uniformly successful, especially in cases of placenta prævia.

DEEP INCISIONS OF THE OS CERVICIS.

—Deep incisions into the os uteri after the disappearance of the cervix are sometimes indicated in cases demanding rapid delivery. Four incisions are made, reaching from the cervico-vaginal junction downward in such a manner as completely to dilate the os by the bloody method, as does Nature by her own unaided efforts. Since no important vessels are cut, primary suture is not necessary. The field for this operation is extremely small, and limited to those cases in which instant delivery is indicated: rapidly deepening coma from eclampsia, embolus of the lung, severe accidental hæmorrhage, impossibility to dilate by other means, a spastic or cicatricial os. The presence of the cervix is a contra-indication to its performance, since, with this, we get a persistence of the internal ring. Its effacement can be effected by dilating the cervix by the rubber bags or the finger, until the cervix has merged into the lower uterine zone.

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In the Prague maternity school, in 3855 labors (1892-95), incision was practiced 24 times, namely: one incision in 1 case, two incisions in 8 cases, three in 9, and four in 6. In 11 cases the incisions were sutured after labor, 7 uniting down to the edge of the external os by first intention. Indications for incisions were: prolapse of cord, 3 cases; eclampsia, 3; dangers threatening fetus, 17; cancer of the portio, 1. Delivery was completed by symphysiotomy and

forceps in 3 cases, by the forceps alone in 14, by turning and extraction in 5, and by perforation and cranioclasty in 2. The puerperium was normal in 17 of the patients; in 3 there was a slight rise of temperature; in 2 parametritis; in 1 mastitis; and in 1 endometritis, salpingitis, peritonitis, and fatal sepsis. This patient was mentally afflicted and very uncleanly. Barkman (*Centralb. f. Gynäk.*, No. 32, '97).

DEEP VULVO-VAGINAL INCISIONS, on one or both sides, is a means of dilating the vaginal outlet when, from immaturity on the part of the patient, spasm or old cicatrices make delivery highly dangerous to the integrity of the parts or impossible. Starting at a point superior to the posterior fourchette and making a deep cut obliquely downward and outward from the vagina effects an incision through, not alone the sphincter ani, but also through the anterior fibres of the levator-ani muscles. This gives a diamond-shaped wound, which can be readily stitched up after the delivery. Its advantages over a simple episiotomy are evident, when we remember that such a very superficial incision has always a tendency to tear farther and so produce irregular lacerations, difficult to sew up, instead of clean, surgical incisions which come together with great nicety by suture.

FORCEPS.—This most important and useful instrument in the entire domain of obstetrical surgery is both conservative and preservative. Conservative in the sense that it saves both mother and child the results of physical injury; preservative by actually anticipating the possibility of immediate or ultimate death of the mother or her unborn child. Still, the forceps should never be used unless there are positive indications for its employment. The head must be in a normal position, or so relatively normal that operative interference will

readily convert it into one. It is always better, however, to convert faulty positions by manual methods before having recourse to instrumental interference. In a face case, chin behind, for instance, manual flexion of the head should be resorted to, to convert it into an occipito-anterior, forceps delivery being then accomplished. It is only applicable when the membranes are ruptured and the os is dilatable or nearly fully dilated. The head must be engaged or at least fixed at the brim.

Series of 2926 deliveries in the Basel Hospital, between May 1, 1887, and December 31, 1893, of which number 156, or 5.33 per cent. of the total number, were delivered by the forceps, and of these 129—83.3 per cent.—were primiparæ. Presentation in the second position was the most frequent cause for their use. Loss of blood was estimated at 19 ounces on the average. In 132 cases—84 per cent.—perineum was ruptured, and wound healed by primary union in 92 cases. Mortality from all these deliveries was 1.28 per cent., but this was not due to the application of the forceps. Infant-mortality was 12.2 per cent.,—5.7 per cent. being the result of use of forceps. Their use is recommended when pains diminish owing to prolonged labor, when the head is in a proper position, and when the second stage has lasted more than two and a half hours. Schmid (*Jour. Amer. Med. Assoc.*, Dec. 15, '94).

Results of use of forceps in 2920 labors. Birth was completed by forceps in 3.63 per cent. of cases. Majority of cases were primiparæ, between 20 and 30 years old. In 60 per cent. of cases the mother was lacerated. Maternal mortality was 4.7 per cent., while 11.32 per cent. of children perished. Of mothers, 1.8 per cent. had septic infection. Conclusion reached, from comparing the use of forceps with other methods of delivery, is that the forceps is the bloodiest method of delivery, and that its mortality-rate renders it a serious procedure for mother and child. Other means of

accomplishing delivery should be exhausted before recourse is had to the forceps. Shick (*Monats. f. Geburts. u. Gynäk.*, B. 1, H. 6, '95).

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Conditions and the indications held at Budapest to justify the use of the forceps are: that the os uteri must be completely dilated; membranes ruptured; the head must be presenting in a position suitable for the forceps, or at least its greatest circumference must be lower than the brim; the head must be of a suitable size and consistence; and there must be no contraction of the pelvis, or if contraction is present the head must have passed beyond it. In 11,064 cases of labor at the Budapest Lying-in Hospital, there were 115 forceps deliveries = 1.04 per cent. In 1895 the percentage was as low as 0.32 per cent. Of the 115 cases, 101 were primiparæ and only 14 multiparæ, so that the proportion is nearly 88 per cent. to 12 per cent.

The number of cases in which injuries were inflicted by the forceps amounted to 69 = 60 per cent., only cases in which sutures had been used being included in these figures. The perineum was torn in 61 cases; in 47 of these the laceration was from 1 to 3 centimetres long; in 11 it extended to the intestine, and in 3 the sphincter was completely torn through. In only 1 case was a deep laceration of the os uteri observed, and in 1 a vesicovaginal fistula. No deaths occurred from the use of forceps. Von Walla (*Monats. f. Geburts. u. Gynäk.*, B. 5, '97).

Forceps should not be applied until the head is under the brim, is well rotated, and the os is dilated. If there is any danger to mother or child it is then justifiable to operate in the absence of these three conditions. Fehling (*Brit. Med. Jour.*, Aug. 20, '98).

We do not sanction the application of forceps to the head above the brim except for one indication, namely: when rupture of the uterus exists or is impending. In all other cases we decidedly prefer the elective version, for fear of causing a rupture in threatened cases or

of increasing the tear in already-present ruptures. Again, we do not advocate the true high forceps application, because non-engagement of the head means either a malposition or a pelvis that is relatively or absolutely contracted.

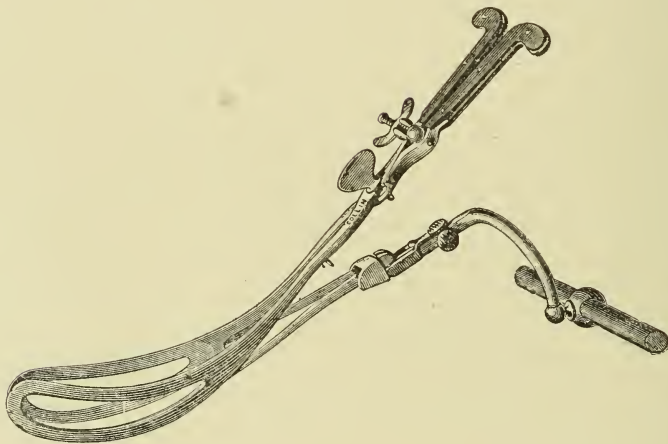
In pelvic contractions, especially of a minor type, the mechanism of labor is different from that which takes place in normal ones. The head engages transversely instead of obliquely, and is hyperflexed. Since many pelvic contractions are antero-posterior, with compensating increase in the transverse diameter, it would appear that Nature conforms with what would be an ideal attempt on her part to overcome the dystocia. If the forceps is applied as usual along the sides of the pelvis, pressure is exerted from side to side; this, in our experience, is not compensated for by an overlapping of the bones, and the biparietal diameter of the head is not increased. According to direct observation, the pressure from side to side causes an increase in the biparietal diameter, which conforms to the contracted antero-posterior diameter, and in this fashion increases the pelvic contraction both relatively and absolutely. For this reason version is elected, for, under the above conditions, the after-coming head, descending, as it should, transversely, pressure is exercised by the antero-posterior contraction on the parietal bosses. This diminishes their diameter where the greatest contraction exists and affords compensatory side-to-side enlargement, which conforms to the enlarged transverse diameter. This, we believe, explains the superiority and safety for both mother and child of version over the high forceps application.

The ideal forceps of our day for all purposes is the true axis-traction for-

ceps: that of Tarnier or Jewett. But its cost and the danger from its use are such as to make it an instrument eminently fitted for the expert only. In the ordinary forceps, the mechanism, as compared to that of the pelvis, does not come into operation, while, in the axis-traction forceps, the head, together with the body of the instrument, obtains great freedom in mobility. A further great advantage in its use applies forcibly to the child. With the ordinary forceps the more powerful the extraction force applied, the greater the compression

cross-rods. Finally it is remarkable with what ease apparently difficult cases are delivered by their use with a minimum force expended. The handles of the forceps are an extremely useful guide as to the position of the head, and consequently an ever-guiding factor: a compass, as it were, as to the direction in which the force of the extraction is to be applied.

The indications for the use of the axis-traction instruments are in nowise different from those of the ordinary forceps. Nor does their application dif-



Tarnier's axis-traction forceps.

force exercised upon the foetal skull, no matter how carefully done, no matter what amount of resistance force or material is placed between the handles at any point to lessen the compression power. Too much space between the handles absolutely insures a loose or unsteady application of the blades and consequently far greater predisposition to slipping. This is entirely overcome in the axis-traction instruments, through which no pressure is brought to bear directly on the head, since all extraction force is applied directly to and from the

fer from that of the latter. It is only after they are locked and ready for use that the mechanism begins to differ. In their use the following rules must always be adhered to: The handles of the blades must be a guide as to the direction of traction, no matter what their position. The position of the blade in its relation to the pelvis must never be taken into consideration and certainly must never influence us as to the direction of our traction energy. The button on the traction-handle, or the point of junction of the traction-

rods with traction cross-handle, must always be nearly in contact, just barely touching, and this relation must be maintained until the patient is practically delivered. To allow the two parts to come into contact will at once influence the utility of the handle-tips as indices, for the tendency would then be to push the handles too rapidly forward and so give us a false conception of the true and ideal axis-traction; its effect would thus be spoiled and our energy rendered futile. Traction is then to be made and continued, the traction-handles carried farther and farther forward and upward until the head begins to crown. It is now advisable either to remove the forceps, or, if the head is to be delivered solely by the forceps, the operator stands to one side of the patient, and grasps both traction-rods and forceps-handles in one hand, while with the other he manages the perineum.

Certain objections to the use of the traction-forceps must, however, not be overlooked. Their cost is far greater; but when we consider the amount of energy saved and the diminished risk to both mother and child, this is compensated for. Their length is an objection in one direction only: the difficulty in finding a vessel large enough for sterilization. Their liability to slip in the hands of the inexperienced is far greater than that of the ordinary forceps, and when this accident occurs the damage done to the maternal structures is far greater and deeper than the slipping of the ordinary instrument. Yet, in the hands of the expert, a slipping instrument is not very uncommon, and should at once suggest that a persistent use of this or any other instrument is fraught with considerable danger in a given case; other measures should be instituted in order to deliver.

[This point cannot be emphasized too strongly. A slipping forceps is either a misapplied forceps or else the instrument is contra-indicated by position or presentation. E. H. GRANDIN.]

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Axis-traction forceps give a better chance to both mother and child. Theoretically the transverse grasp of the child's head is the right one, but practically it is often impossible. Robert Jardine. (*Brit. Med. Jour.*, Aug. 20, '98).

During the time from 1892 to 1895 there took place in the Copenhagen Royal Maternity Hospital 6294 confinements, 242 of which were terminated by forceps. The axis-traction forceps was used in 45 cases. The head should either be fixed or in the pelvic inlet before the forceps is applied; then, if properly performed, the operation is free from danger, but the mortality to the child is rather high—16 per cent. being still-born. Stadfeldt (*Bibliothek for Laeger*, '98).

The simplest, easiest, and most powerful method of applying axis-traction with the ordinary forceps is as follows: The patient being in the ordinary left lateral position, the blades are inserted so that the lock falls together. The handles are permitted to assume their natural position close to the symphysis pubes and pointing forward. They are allowed to remain during the whole process of extraction in this, the position that they naturally assume, pointing more and more forward as the head descends. To extract, the forceps is grasped at or above the lock with the left hand, and the hollow of the right hand is placed on the posterior surface of the extremities of the handles, so as to be able to push with the right hand and pull with the left, by an action somewhat similar to that used in making a stroke with a paddle. Then, keeping both arms the whole time rigid and extended, the operator's chest, facing the patient, is placed in the desired line of traction, which, with the head at the brim, is a straight line passing from the patient's umbilicus through her coccyx, and reaction is made with the operator's

back from the coccyx. T. Archibald Dukes (Brit. Med. Jour., Nov. 5, '98).

VERSION.—In version we recognize but one procedure, and that is the true internal version. This manœuvre is indicated in all cases when the presenting part fails to engage or when the presenting part is an abnormal one, such as occurs in abnormalities, as transverse positions, prolapsus funi, etc.; when hæmorrhages in placenta præviæ must be checked; and in cases in which, because of a malposed vertex, engagement fails. As pelvic contraction is the most frequent cause for the non-adaptation of the head, the limitations must be fixed as closely as possible. We are told that a $3\frac{3}{4}$ -inch pelvic inlet is the lowest limit in which version is warrantable. This calculation is purely arbitrary and uncertain. Such close figuring must depend on the *accoucheur* and is largely a matter of personal equation. It is again the question of passage-way and passenger. A head that is slightly larger than the pelvis can always be delivered by version no matter what the size of the pelvis is. If when version is to be performed the patient is placed in the Walcher position, a pretty large head can always be brought through a rather small pelvis, if the head be kept well flexed by suprapubic pressure and guided through the largest possible diameter.

Statistics from Leopold's clinic of version and extraction in narrow pelves. From January, 1888, to May, 1892, there were 6090 labors and 143 versions (2.3 per cent.); 16 of these were for placenta præviæ, the patient being generally placed on her back and an anæsthetic given. Version was made by one or both feet. There was sometimes twisting of the cord. Extraction was made after version, except in 11 cases, in which spontaneous version as far as the

umbilicus was awaited. Rosenthal (Centralb. f. Gynäk., p. 125, '93).

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Version with the patient in the prone position (face downward) has the following advantages: The outlet of the pelvis is directed above with the patient prone, giving the operator much more room for the insertion of the hand. The operator's hand and arm are in the position of pronation, giving a better use of the muscles and tactile sense. This posture widens and opens the uterus and vagina; the contraction-ring disappears in these cases. Risk of bruising the soft parts is less with the patient in this position. The patient has a pillow under the chest, her head turned to one side, while the operator may sit beside her, using either hand for version. By this posture two dangers are minimized: tearing the uterus from the vagina and air-embolism. Patients suffer less pain in this posture. Mensinga (Centralb. f. Gynäk., No. 23, '96).

Fifty-nine cases of labor in contracted pelves of the first and second degrees in which version was performed, and 215 cases in which the expectant plan of treatment was adopted. As far as the mother is concerned, the result is the same in both methods; for the child the expectant plan is much more favorable. The advantages of the expectant method were most apparent in the most difficult cases,—that is, where there was the greatest disproportion between the size of the foetal head and the capacity of the pelvis. In and of itself a contracted pelvis should never be regarded as an indication for version. Matseevsky (St. Petersburg Univ. Thesis, '98).

When it is thought that a version in the Walcher position will not result in the delivery of child for any reason, such as a tetanized uterus, or when the child cannot be turned, we are brought to consider symphysiotomy.

SYMPHYSIOTOMY.—This operation stands between version and the Cæsarean operation. Accepting the lowest limit

for version as $3\frac{3}{4}$ inches and allowing about $\frac{3}{4}$ inch for the increase which the Walcher position gives us, this reduces the version limit to 3 inches, providing, of course, that the child is of average size. On the other hand, it is known that an absolute indication for the Cæsarean section is one in which practically no opening in the pelvic inlet exists—up to $2\frac{1}{2}$ inches, which will not even allow the passage of a mutilated child. Comparing these figures, we must agree that the field of limitation for a symphysiotomy is a very small one.

Marx contends that, from the standpoint of after-results (maternal lesions; large foetal death-rate), the operation is both dangerous and uncertain.

[Taking the statistics of the operation *en masse*, it must be considered as dangerous, so far as maternal injuries are concerned, and as relatively futile, so far as foetal life is at stake. But in the hands of the expert and under proper limitations the operation is life-saving to the child and the ultimate results to the mother should not be untoward. E. H. GRANDIN.]

It cannot compare in its immediate and remote results with the modern Cæsarean section as done by the technique-perfect obstetrical surgeon. The indications for the operation have been stated as well as possible in a negative fashion above. Its contra-indications are: too much pelvic contraction or too large a child; ankylosis of either sacro-iliac joints; a dead or dying foetus; and sepsis, the last being an absolute contra-indication for its performance.

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Operative technique of symphysiotomy:

Full dilatation of the cervix is to be secured if possible without risk to the child. The urethra and bladder should be held to one side with a sound. The

initial incision is made a little above the subpubic arch and under the elevated clitoris. Then the left index finger is introduced within the vagina, against the posterior groove or ridge of the joint, up to the top and a narrow tenotomy-knife is passed with the point close to the joint, up to within a half-inch of the top, and under the underlying soft tissues. A probe-pointed bistoury is substituted and the left index finger met with the probe over the top of the joint, and the blade is worked through the joint downward until separation is felt by the posterior finger. An assistant should press the mouth of the wound and tissues lying over the joint with a small piece of gauze. Delivery is to be accomplished with forceps, if possible, refraining from suprapubic pressure, aiming to deliver the head through the cervix without drawing the latter down below the symphysis. The bladder is to be held well to one side while pressing the pubic bones together. A small strip of gauze is then passed into the prepubic wound, and another against the cervix, after irrigating, leaving both pieces exposed for easy removal, having refrained from stitching cervix or perineum. A soft-rubber catheter is introduced into the bladder and left until sure the patient can voluntarily micturate.

The vulva is dressed with gauze and the joint strapped with adhesive strips. All the gauze should be removed in thirty-six hours and the vulva and vagina should be irrigated twice a day, the vulva being kept carefully dressed between-times. E. A. Ayers (Amer. Jour. of Obstet., July, '97).

During the year ending December, 1896, 95 patients, who had some pelvic abnormality, were confined in the Baudelocque Clinic. Fourteen cases were treated by symphysiotomy. In 7 instances the operation was done upon primiparæ, and in 7 upon multiparæ. All of the patients had rachitic pelvis, and one had, in addition, luxation of the hip-joint. After the operation, 13 of the children were extracted by forceps and 1 by version. Results were: in 14 cases 12 mothers and 10 children recovered;

2 women and 4 children perished. Of the fatal cases among the mothers, 1 died of pneumonia, the other of streptococcic infection. The infant-mortality was largely due to aspiration-pneumonia. Pinard (*Annales de Gynéc.*, No. 47, '97).

At clinic at Leipzig, 31 symphysiotomies personally performed; all of the mothers recovered without inconvenience or injury; 27 of the children survived and left the hospital in good condition. Referring to cases reported in which patients could not walk without difficulty, this is considered to be due to the excessive stretching of the pelvis and especially to injury of the sacro-iliac joint. The operation should be limited to cases in which the conjugata vera is not less than $6\frac{75}{100}$ centimetres, and best results are obtained when the limit is placed as high as 8 or $8\frac{1}{2}$ centimetres. Zweifel (*Monats. f. Geburts. u. Gynäk.*; *Brit. Gyn. Jour.*, Nov., '98).

The dangers of symphysiotomy are hæmorrhage; tears of the urethra, bladder, or vagina; septic infection; inflammations of the pubic joint; and failure of union. Danger in Cæsarean section is from sepsis and the possibility of ventral hernia. Statistics show a much smaller mortality for Cæsarean section for both mother and child than for symphysiotomy. Operation of Cæsarean section is also much easier of performance. Washburn (*Boston Med. and Surg. Jour.*, June 30, '98).

CÆSAREAN SECTION.—When for any reason the pelvis is rendered, by tumor or contraction, impassable for the unborn child, dead or alive, we have an absolute indication for the performance of a Cæsarean section. The operation is indicated when there is a small pelvis with a large child, and, occasionally, when the maternal parts are not dilated and the patient's condition demands an immediate delivery, as, for instance, in placenta prævia or eclampsia. Again, carcinoma in a pregnant uterus at times justifies this operation plus a total hys-

terectomy; so does a severe case of ante-partum sepsis. In the relative indications a living child, before the operation is undertaken, is a *sine qua non*.

The limitations for this operation have already been given; the advisability and the necessity of such must always rest with the operator.

The newest incision recommended by Fritsch is one that extends, not through the centre of the uterus, but transversely from one horn to the other, a little below and anterior to the fundus. Its advantages are the absence of important vessels above as compared to those in the lower uterine zone, the smaller wound, the ease of extraction, and the minimum danger from hernia of the abdomen, because of the higher situation of the external incision.

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Technique of improved Cæsarean section: Strict antisepsis, four assistants; incision six inches, equal distance above and below umbilicus; seize uterus by left upper cornu, lift out, close incision partly above; place rubber tube around cervix, crossed but not tied, to be tightened as necessary. Incise uterus in median line, clamp bleeding vessels, avoid lower segment, incision four to five inches; if placenta is on anterior wall cut through it; if waters have not broken avoid soiling peritoneum. Introduce right hand, extract child by head if possible, if not by extremities; tie cord, divide, give child to assistant. Remove placenta if loose, if not insert sutures, but do not tie until placenta, now having loosened, is removed. Cervix should be open; silk No. 4 for deep suture in uterus, finer sutures for superficial, one suture for each inch; peritoneum united by broad surfaces. All sutures tied, elastic ligature gradually removed; abdomen closed. Do not curette uterus. Woman allowed up in three weeks. H. G. Garrigues (*Med. Rec.*, Feb. 1, '96).

Advantages of a transverse cut across

the uterus at the fundus. In a recent operation the abdominal incision was made so that the navel was in the centre of the cut. Hernia is less common after a high incision. The placenta was quickly and easily extracted without bleeding; the child's legs were readily grasped; the womb quickly contracted, seven sutures closing it completely. The incision was about $3\frac{1}{8}$ inches long. Rapid recovery followed.

In operating upon the uterus the anatomy of the vessels is such that bleeding is best controlled when the uterus is incised transversely to its long axis, at the fundus. At the level of the tubes and ovaries the incision should be longitudinal to secure the vessels most readily. Fritsch (*Centralb. f. Gynäk.*, No. 20, '97).

Though the transverse fundal incision bleeds but little, the fetus cannot always be extracted through it. The necessity for a vertical incision in addition causes so much damage to the uterus that it becomes safer to remove that organ than to close the double wound by sutures. Hence the conservative aim of the operator is completely defeated when a "Fritsch incision" will not allow of the extraction of the fetus. Steintal (*Centralb. f. Gynäk.*, No. 14, '98).

Sänger's conservative Cæsarean section performed 25 times. Of 18 patients that recovered 5 have already become pregnant again. Transverse incision along the fundus is disapproved; the wound in that case heals badly, as the vascular supply is interfered with by the sutures, secondary infection is very probable, and there is a greater chance of visceral adhesions than when the incision is longitudinal, facing the parietes. Most essential point in Cæsarean section is accurate and safe union by suture of the longitudinal incision. Speedy union of the uterine wound is of first importance. This must be effected by three layers of sutures, so that the edges are kept together as closely as possible in spite of atony or contractions of the uterine muscular tissue. A deep layer of sutures should be passed, the ends of which are brought out into the uterine cavity and tied there against the decidua. Then a

middle set, and afterward a more superficial set, are passed into the muscular coat and tied on the surface of the uterus. Everke (*Wiener med. Woch.*, No. 51, '98).

Cæsarean section and symphysiotomy compared, observations being based on: (1) Leopold's results of 100 Cæsarean sections; (2) Pinard's results of 90 symphysiotomies; (3) personal results of both procedures at the Liège Maternity. With complete asepsis the mortality of Cæsarean section should not be over 5 per cent. It is a better operation than symphysiotomy on the grounds that (1) it is easier to perform, since no special instruments are required, only soft parts are cut through and these are exposed to view, any hæmorrhage is easy to control, and the operation is quickly finished, while in symphysiotomy much of the cut part is out of sight; after the point is severed there is still the difficult task of delivering the baby, for which purpose obstetrical forceps are generally needed, and serious tears of the soft parts are likely to result; (2) it is safer as regards hæmorrhage and injury to adjacent parts, just as safe as far as sepsis is concerned, and it has a less tedious convalescence with no fear of a loose pelvis, though there is slight fear of ventral hernia. Charles (*L'Obstét.*, Nov. 15, '98).

Cæsarean section is not difficult to one who has had some experience in laparotomy. It is, however, dangerous if the least detail of antisepsis is omitted, and should never be done in women who have become septic. It is also dangerous through the possibility of atonic hæmorrhage, which may require ablation of the uterus.

Analysis of 170 operations gives a maternal mortality of 6.41 per cent., and a foetal mortality of 5.57 per cent. Bar (*L'Obstét.*, May 15, '99).

Suprapubic hysterectomy with intraperitoneal treatment of stump advocated in pregnancy at term for obstructed labor. Porro operation preferred to cælio-hysterotomy. W. M. Polk (*Med. Rec.*, Mar. 4, '99).

VAGINAL CÆSAREAN SECTION, one of

the newest of the various obstetrical operations, is one whose indications are: normal size of child and pelvis; pregnancy at or near term; malignant growth of uterus or other obstructing tumor which renders its delivery safe through the vagina and whose persistent presence renders its removal justifiable. Under these conditions the vaginal Cæsarean hysterectomy has been recommended by Dührssen. The technique of the operation is as follows: After thorough asepsis, the anterior and posterior *cul-de-sacs* are dissected up and the arteries and bases of the broad ligaments either angiotribeled or tied off. The cervix and lower uterine zones are now split up on two to four sides extending above the internal ring. The membranes are then ruptured, the child is delivered, the placenta extracted, and the hysterectomy finished "*lege artis*" as in the non-pregnant woman.

Literature of '96-'97-'98.

Less dangerous than the classical Cæsarean section is an operation by which, in spite of closure of the cervix, and without opening the peritoneum, a living child may be delivered by the vagina. The portio is exposed by a large speculum, and, sagittal openings having been made in the anterior and posterior vaginal vaults, the bladder and vesical fold of peritoneum and that of Douglas's pouch are detached from the cervix and lower segment of the uterus, which are then divided in the median plane. After the bleeding has been arrested by ligatures, the hand is introduced and the child extracted. The operation is indicated when, with an undilatable cervix, the mother's life is imperiled by circumstances which may be improved, or set aside, by emptying the uterus; for example, in severe eclampsia or uræmia; in cases of serious internal hæmorrhage from a normally-situated, but prematurely-displaced, placenta; in grave pulmonary or cardiac disease; in the interests of the child, when the con-

dition of the mother is expected to prove rapidly fatal; and, finally, in pathological conditions of the cervix (stenosis, rigidity, myoma, carcinoma) or of the lower segment of the womb (pathological bulging). In new growths of the cervix the operation may be supplemented by vaginal hysterectomy, which, directly after delivery, can be performed in a few minutes, by Doven's method. Dührssen (Berl. klin. Woch., p. 530, '96).

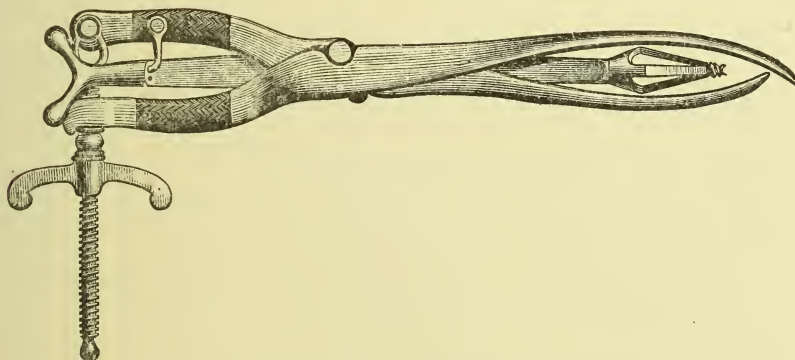
Surgical Measures Indicated in Fœtal Obstruction.—These are all destructive to the child; they are, however, conservative, since they are preservative to the mother. In actual practice our first duty is to the mother, and under no condition should danger to the child influence the *accoucheur* in increasing the danger to the mother, unless, of course, the full consent of both parents is obtained. Where mother and baby have equal chances, those chances should be well weighed and operative influence estimated. In all difficult and prolonged labor cases in which many operators have examined and many instruments have been used, and operations have been attempted and failed, the child as a result of these prolonged, fruitless, and severe manipulations has often suffered so severely as to have been nearly or already sacrificed. In such cases, a deliberate perforation ought always to hold preference. The perforator is an instrument still possessed of a large field of application. It is our rule to perforate or dismember in all cases in which the child is suffering very severely or is dead, no matter what its position in the pelvis is, except where the head can with safety to the mother be delivered by instrumental or manual extraction. We therefore have at our disposal the following operations: 1. Basiotripsy. 2. Cranioclast to the head. 3. Cranioclast to the breech. 4. Total embryotomy. 5. Decapitation. 6. Cleidotomy.

CRANIOCLAST.—The use of the cranioclast we have given up entirely, since the instrument, at least in our hands in difficult cases, has repeatedly pulled out, making it a sort of osteoclast.

BASIOTRIBE.—In the place of the cranioclast, the basiotribe of Tarnier has proved a wonderfully successful and staunch instrument. When once it is in place, it holds on “like grim death.” Its application is somewhat complicated, since its three distinct parts act in unison, the central part the perforator, on each side the heavy cephalotribe-like blades gripping, not alone the head, but the base of the skull.

TOTAL EMBRYOTOMY is rarely performed, since one or the other of the destructive operations will answer.

DECAPITATION.—In impacted transverse or shoulder presentations a deliberate decapitation will nearly always precede an embryotomy if the latter operation is at all necessary. But when after decapitation it is impossible because of spasm to deliver, dismemberment is in order; or, if the child be macerated, it is also indicated, since a purchase on one or both feet will result in their being torn off. In locked twins it may become necessary to decapitate one or both children.



Tarnier's basiotribe. (*Grandin and Jarman.*)

CRANIOCLAST TO BREECH.—This is an operation original with Simon Marx. It is indicated in bad cases of breech impaction in any part of the pelvic tract when it is impossible to break up the wedge, either by pulling down a foot or using firm abdominal pressure to cause the breech to emerge. This class of cases is met with in prolonged labors with tetanus uteri. The anus is enlarged by means of scissors, one blade is introduced into the anus, the other grasping the sacrum high up and the compression-screw sent home. A good purchase is then obtained and the breech delivered.

CLEIDOTOMY, or cutting through one or both clavicles, is one of the new destructive operations. It is indicated in impacted shoulders either in case of spastic contraction or when the shoulders are abnormally developed and large. Thus, occasionally, after delivering the head, it is impossible to deliver the trunk because of a pair of enormous shoulders. The child promptly dies, and brute force would only succeed in making frightful lesions of the genital tract. If now a pair of stout scissors are introduced and the clavicles are deliberately cut through, the chest instantly

collapses, its diameter is diminished, and speedy delivery follows.

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New York.

PELLETIERINE.—Pelletierine, or punicine, is the alkaloid obtained from the root-bark of the pomegranate (*Punica granatum*, L.), or granatum, U. S. P. As found in the shops it consists of a mixture of pelletierine and isopelletierine. It occurs as a colorless, oily liquid, of aromatic taste and odor, and is soluble in 20 parts of water, and more soluble in chloroform, alcohol, and ether. It readily forms salts with the acids, of which the tannate is most commonly used. The tannate occurs as a yellowish or grayish-brown, hygroscopical powder, having a slight astringent taste. It is soluble in 80 parts of alcohol, in 700 parts of water, and in warm dilute acids. Tanret's pelletierine is a syrupy solution, sold in bottles, each containing one dose.

The official granatum is seldom used in the crude form. A decoction (4 to 16) in doses of 4 to 6 ounces, or fluid extract in doses of 1 to 2 drachms, is sometimes employed, but neither is official.

Physiological Action and Therapeutics.—Pomegranate is a powerful astringent, and a decoction, flavored with aromatics, is useful in pharyngitis and as an injection in urethritis. Coronedi has found that pelletierine, in poisonous doses, paralyzes the peripheral ends of the motor nerves very much in the same way as curare does, without influencing contractility or destroying sensibility, and acts chiefly on the lower limbs, in which cramps may precede the loss of power. Pelletierine may also cause nausea and vomiting.

Literature of '96-'97-'98.

Autopsy made on a man, 34 years of age, who had died in a comatose condition some hours after having taken a dose of 7½ grains of sulphate of pelletierine. Strychnine poisoning was suspected, but sulphate of pelletierine was found in the viscera. The patient was an epileptic, and epilepsy is personally considered contra-indication to the use of pelletierine. The sulphate of pelletierine is much more dangerous than the tannate, and it is recommended to administer tannin at the same time as the sulphate of pelletierine. Crolas and Boyer (Lyon Méd., July 3, '98).

A decoction of pomegranate was formerly used in serous diarrhœa and profuse sweats and in dysentery, but on account of its disagreeable taste and effect upon the stomach it is no longer used.

Dujardin-Beaumetz has successfully used pomegranate in Ménière's disease. According to Galezowski, pelletierine is of service in paralysis of the third and sixth nerves.

The special use of this drug is for the destruction of tape-worms. In tropical countries the powdered bark is used in doses of ½ to 1½ drachms. The decoction (made by soaking 2 ounces of the bark in 2 pints of water for twenty-four hours, and then boiling down to a pint) is a nauseous dose, but generally efficacious; a wineglassful of this decoction is taken every hour until the whole pint is taken. Generally purging and vomiting follow, but, should purging not occur, castor-oil or other good purge should be used to expel the worm. A previous fast of twelve hours is necessary, whatever form of this drug is used.

Pelletierine tannate is given in doses of 3 to 15 grains, in 1 ounce of water, followed in two hours by a brisk purge. As serious paralytic symptoms have ensued after the ingestion of 5 grains by a

susceptible woman, not more than this amount should be given.

PEMPHIGUS.

Definition.—This is a comparatively rare skin affection characterized by the formation of blebs, or bullæ, containing a serous or sero-purulent fluid, and often attended by constitutional disorders.

Varieties.—Three main varieties of pemphigus are recognized: (1) *pemphigus vulgaris*, which may be acute or chronic and usually terminates fatally; (2) *pemphigus foliaceus*, a malignant form, in which the bullæ are purulent from the start, rapidly increase, do not heal, and are replaced by lamellæ, or scales; and (3) *pemphigus neonatorum*, an acute infectious form observed in infants at birth or soon after birth and usually ending in recovery.

Symptoms.—PEMPHIGUS VULGARIS.—There usually appear a few discrete bullæ about the face which gradually invade the entire body, but especially the trunk and upper extremities. The bullæ contain a serous liquid which in some cases becomes purulent and hæmorrhagic. Itching and burning are experienced, accompanied by slight prostration, anorexia, and, occasionally, slight fever. The disease remains stationary some weeks, and then suddenly assumes a state of exacerbation, during which more bullæ are developed or older ones become greatly increased in size, and confluent. Successive attacks occur, weeks or months apart, each being attended by sharper manifestations, local and general. The oral cavity, the eyes, the genitalia, and the respiratory and gastro-intestinal tracts are gradually invaded, and the patient sinks into a cachectic condition from which he does not rally. This constitutes what is often termed the chronic, or slow, form.

In the acute form the symptoms outlined merely occur in closer succession and are grave from the start, chills, high fever, delirium, albuminuria, etc., following in rapid succession. The eruption, however, is usually limited to the upper part of the body and is discrete (Bazin). Death occurs in from ten days to two weeks after the onset. It greatly resembles a contagious form, which, however, is much more rare.

PEMPHIGUS FOLIACEUS.—In this form the bullæ may become developed as in the preceding variety, but they are apt to be flattened. They contain a small quantity of foul-smelling liquid or pus and rupture easily. Other bullæ forming around the older ones, the entire surface becomes covered; the underlying skin, failing to heal, presents a raw and red appearance, recalling a superficial burn (Hebra). Oval or round scales or leaf-like crusts (whence the name) are formed over the older bullæ, and the skin itself appears scaly, retracted, creased, and ulcerated in various spots. Painful itching and smarting, followed by various complications,—enteritis, pulmonary congestion, etc.,—give rise to considerable suffering, and the patient gradually sinks in marasmus if he is not carried off by one of these intercurrent disorders.

PEMPHIGUS NEONATORUM is seldom, if ever, present at birth, and does not develop before the third day, rarely later than the fourteenth. The eruption, unless complications occur, is not accompanied by fever, and consists of round or oval blisters upon apparently normal skin. These blisters are at first transparent, slightly yellowish, and are surrounded by a reddish areola, which in rare cases invades the surrounding tissue. The blisters usually rupture, and in severe cases give rise to an appearance

resembling that of pemphigus foliaceus of adults. After the blisters have broken a raw surface is left, covered by membrane; but, unlike pemphigus foliaceus, the skin beneath rapidly recovers. This disease is infectious, and infants are, as a rule, either infected by the physician or the midwife, who may be suffering from the disease (Luithlen). It occasionally proves fatal, the appearance of thrush and intestinal disorders being unfavorable signs in this connection.

Etiology and Pathology.—Pemphigus is believed by many modern observers to be the active manifestation of a neurosis. It is often met with in neurotic or hysterical subjects, chronic drunkards, and syphilitics. In a case of pemphigus foliaceus Schlesinger found syringomyelia to have been present. On the other hand, there is considerable evidence in favor of the view that it is due to a special micro-organism.

Demme, Claessen, Bullock, and, more recently, Whipham found in the contents of the bullæ a diplococcus which grew as a pure culture outside the body, and caused death when injected into guinea-pigs. Whipham obtained pure culture from the blood of animals thus infected and inoculated others, which after death showed typical manifestations in the lungs.

Treatment.—Arsenic in gradually-increasing doses is usually preferred in pemphigus vulgaris, given until the physiological effects are noted. Small doses of strychnine given hypodermically are also valuable. Tonics are important aids and the patient should receive food rich in proteids, while the emunctories, the intestinal and urinary systems, should be kept active if a tendency to torpidity is apparent. Warm baths, especially bran-baths, are soothing and tend to relieve the pruritus and burning sensation

experienced. Externally, oxide of zinc and boric-acid ointment are useful; when the burning is severe, an effective remedy sometimes is a solution of acetate of lead in linseed-oil.

PENIS AND TESTICLES, DISEASES AND INJURIES OF.

Diseases of the Penis.

Anomalies.—Anomalies of the penis are so extremely rare that they possess but little clinical significance. Such patients are often mentally deficient and so afflicted with other extensive malformations and deformities that they rarely survive for any great length of time.

ABSENCE OF THE PENIS.—This is the rarest of anomalies of the penis, and, with the exception of a case reported by Demarquay, practically unknown except in very young children. The urethra may open into the rectum, by the margin of the external sphincter, or in the perineum. It is highly probable that some of the cases of absence of the organ are really instances of rudimentary or concealed penis.

CONCEALED PENIS.—A few cases have been reported in which the penis was small, undeveloped, and concealed beneath the skin near its normal situation. Urine was passed through a fistulous opening in several cases; in others no opening could be found, and retention of urine followed.

Treatment.—In every case of apparent absence the organ should be carefully searched for, freed by incisions, and by a plastic operation covered by skin taken from the neighboring parts.

RUDIMENTARY DEVELOPMENT.—Rudimentary penis, especially when complicated with cryptorchism or other abnormalities, is not uncommon. Men of middle age with genitalia no more developed

than children of five or six years are frequently seen. Many of these cases, however, are capable of marital relations, and have successfully impregnated women, although impotence is the rule.

Treatment.—In many instances but little can be done for the relief of this condition. When seen in early life, preputial adhesion or a tight phimosis should be relieved. In the young adult a suction-apparatus has been recommended and employed with considerable success. A bell-jar fitting tight around the root of the penis is exhausted by a rubber bulb, thus causing congestion and distension of the erectile tissue. Such treatment should be carried out over a long period.

HYPERTROPHY OF THE PENIS.—The size of the penis bears no relation to the size of the individual. In imbeciles and dwarfs it may be enormous, while in the well developed it may be quite small. Hypertrophy of the penis may render coitus impossible, and may be a source of danger by predisposing the patient to abrasions and fissures through which he may become inoculated with venereal poison.

DOUBLE PENIS.—This anomaly has been noted in several authentic instances. The two organs are usually placed side by side, and other evidences of monstrosity generally exist (supernumerary limb). In several of the cases the function of both organs was perfect, as regards urination, capability of erection, and seminal emission.

TORSION OF THE PENIS.—Twisting of the penis on its long axis so that the frænum is uppermost is most uncommon. Urination and ejaculation of semen are, as a rule, not interfered with; hence no treatment is required.

ADHERENT PENIS.—Through nearly its entire length the penis may be ad-

herent to the scrotum,—of course, interfering with its function.

Treatment.—Such a deformity should be operated upon as soon as discovered in order to prevent stunting or incurvation of the organ. The membranous septum should be divided along its entire length, and the raw surface remaining closed by sutures or by a plastic operation.

Anomalies of the Prepuce.—The prepuce may be absent, redundant, or incompletely developed. Absence of the foreskin calls for no treatment, nor does incomplete development unless complicated by phimosis or an irritated or inflamed glans penis.

ADHERENT PREPUCE is often responsible for many reflex phenomena of a convulsive or paralytic type and stunted growth of the penis. Its treatment can be readily carried out, in most instances, by relieving the phimosis either by performing circumcision or by stretching the præputial orifice. The raw surfaces resulting from the latter procedure should be smeared with an ointment composed of a drachm of boric acid to the ounce of carbolyzed cosmolin. The glans penis should be washed daily with mild antiseptic solutions and the ointment reapplied. As cellulitis followed by death has resulted from this stripping process, at least ordinary antiseptic precautions should be observed.

OCCCLUSION OR OBLITERATION of the præputial orifice may not be detected immediately after birth, but the appearance of a tumor at the end of the penis due to the accumulation of urine will soon call attention to the trouble. The treatment of this condition is circumcision.

SHORT FRÆNUM.—This congenital deformity occasionally interferes with complete erection, turning the orifice of the meatus down, and not only preventing

ejaculation in the proper direction, but rendering coitus painful or impossible.

Treatment.—The base of the frænum should be divided by a narrow bistoury, and the prepuce kept retracted until healing is complete.

Phimosis.—A preternatural elongation of the prepuce with a contracted orifice rendering it impossible to uncover the glans penis is termed phimosis. The præputial orifice may be so small that a probe cannot be made to pass (“pin-point” orifice).

Varieties.—1. Congenital (always permanent). 2. Acquired: inflammatory (usually temporary); cicatricial (always permanent).

CONGENITAL.—The prepuce begins as a fold of tissue about the third month of foetal life; as it grows forward, the inner surface of the foreskin becomes adherent to the glans penis. During the first year of life the prepuce generally becomes loosened; should this not occur a true phimosis results.

ACQUIRED.—The acquired may be either inflammatory or cicatricial. The inflammatory—balanoposthitis—usually occurs as a result of various forms of ulceration about the glans and prepuce. Cicatricial contraction results from the healing of ulcers, injuries, and bad circumcisions—the mucous membrane being left too long, thus permitting the scar to slip in front of the corona glandis.

Symptoms.—Moderate phimosis may exist without giving rise to symptoms. However, as a result of the decomposition of the retained smegma and urine and obstruction to the flow of urine, symptoms may develop which are exceedingly distressing and may permanently impair the general health. In children there are symptoms which often simulate vesical calculus: balanitis, heat, itching, pain

at the head of the penis, frequent erections, pain on urination, frequency of micturition, dysuria, or incontinence. Under the remote effects may be considered malnutrition, choreic movements, paralysis, convulsions, prolapse of the rectum, hernia, atony of the bladder, the latter conditions being most frequently seen when there is marked contraction of the præputial orifice requiring severe straining efforts to be made during urination. In older children the condition is apt to give rise to priapism, and is undoubtedly the cause of masturbation and often an arrest of development of the penis.

After puberty and later, functional sexual troubles begin: erections occasion intense pain, the repeated attacks of balanoposthitis reflexly predispose to nocturnal emissions, and coitus is painful or impossible.

When phimosis is unrelieved, the irritation of chronic balanoposthitis is the frequent cause of fissures, vegetations, and adhesions, in later life, and, in consequence of it, cancer is liable to occur.

Phimosis is a strong predisposing factor of penile cancer. Direct contagion seems to be the cause in some instances. Edward Martin (*Jour. of Cut. and Genito-Urin. Dis.*, Mar., '95).

It is not uncommon in long-standing cases of phimosis to find one or more calculi beneath the prepuce due to decomposition of the urinary salts. These calculi may be very small, but, however, may weigh several ounces.

Treatment.—Permanent phimosis, whether congenital or acquired, should always be treated by operation (circumcision). In the majority of instances congenital phimosis is spontaneously relieved. If the epithelial separation is not complete at birth, it may be quickly accomplished by the flat end of a probe,

the raw surface left being covered with carbolized oxide-of-zinc ointment to prevent adhesions.

Literature of '96-'97-'98-'99.

Gradual dilatation proposed for the cure of phimosis of young children. The orifice is first dilated with bougies and afterward manually. Dilatations are then to be carried out every ten to twelve days for three months. Schilling (*Wiener med. Woch.*, Mar. 14, '99).

For temporary phimosis following inflammations and ulcerations subpræputial injections of Castile soap and hot water with a flat-nozzled syringe should be made twice daily, followed by the use of a lead-water-and-laudanum solution to which $\frac{1}{2}$ drachm of carbolic acid has been added to every 6 ounces. During the day the entire organ should be surrounded with lead-water and laudanum.

CIRCUMCISION.—Operation for the removal of the prepuce is indicated in chronic balanoposthitis with or without adhesions; certain cases of paraphimosis; to prevent masturbation; when the sexual orgasm is too early induced; to prevent gangrene of the glans penis consecutive to concealed ulceration; tuberculosis, and epithelioma.

Literature of '96-'97-'98-'99.

For an all-around long-liver the Hebrew holds a pre-eminence; circumcision has no counter-claimant. Circumcision insures children better health, greater capacity for labor, longer life, less nervousness, less sickness, loss of time, and a lesser chance to become a masturbator. H. Bamberger (*Amer. Med. Compend*, July, '99).

The usual antiseptic precautions are to be observed. With a pair of Ricord's phimosis-forceps the prepuce is grasped just at the corona glandis, parallel to its obliquity, and the prepuce is drawn in front of the glans as the forceps are

locked. With a sharp-pointed straight bistoury the prepuce is divided with a sawing motion through the fenestra of the forceps. The skin now retracts behind the corona, exposing the inner or mucous layer of the prepuce still covering the glans. With a fine pair of scissors this is now divided in the median line to the corona. The two flaps remaining are then cut off close to the edge of the corona, leaving just sufficient tissue to hold a stitch. This will prevent the scar from slipping in front of the corona, thus causing a return of the phimosis. The frænal artery is now twisted or ligated with fine catgut, and the wound closed with fine black silk sutures. The first suture should be introduced at the frænum, the second at the dorsum, and two or three at intervening points on both sides; care should be taken that the raw surfaces be accurately approximated. A gauze bandage wet with a 25-per-cent. boroglyceride solution should be applied as a dressing. The bandage should be removed daily or every other day and the parts irrigated with 1 to 5000 nitrate-of-silver solution, and the boroglyceride dressing be applied.

When the penis is large, the operation may be done without the aid of forceps. A grooved director is introduced between the glans and the prepuce exactly in the median line, and on it, both layers of the prepuce are divided at one time by scissors to the corona. An assistant with dissecting forceps makes slight traction upon the triangular flaps remaining, and with curved scissors the skin and mucous membrane are cut off close to the line of the corona as above described.

Paraphimosis.—Inability to draw forward a retracted prepuce from behind the corona glandis may be caused by gonorrhœal balanoposthitis, chancres, chancroids, violent coitus, retraction of a

tight prepuce, and any lesion of the glans or prepuce attended by swelling.

Symptoms.—As a result of the mechanical constriction of the præputial orifice, the glans penis rapidly swells, and becomes red and tense. Over and behind the coronary sulcus is a brawny swelling, which represents the mucous layer of the prepuce. Behind this another deep groove is seen, which corresponds to the præputial orifice, the seat of constriction. If left untreated, gangrene may result; or it may remain chronic, the retracted tissue becoming inelastic and indurated.

Treatment.—When paraphimosis is of sudden development and not dependent upon œdema consecutive to ulcerative lesions, reduction should be attempted immediately. The organ should be rendered bloodless either by gentle pressure or by the application of a small finger bandage. The parts are then greased well with sweet oil, the index and middle fingers of each hand are crossed behind the glans penis, and with the thumbs attempt should be made to force the glans penis through the swollen tissue. When reduction is possible, the foreskin will slip forward with a characteristic snap. Failing in this, the præputial orifice is to be divided in the second groove on the dorsum with a curved sharp-pointed bistoury, cutting from within outward. Hot compresses should be applied for several hours to restore the circulation and favor the absorption of the œdema.

When paraphimosis is consecutive to ulceration and in no danger of causing gangrene, hot compresses or lead-water should be applied and at the same time the original lesion should be treated. These cases usually reduce spontaneously. If not, they should be treated as above described. Should the brawny œdema of the reduced tissues persist for several

weeks or months, circumcision is to be recommended.

Injuries of the Penis.—**CONTUSION**—Severe contusions of the penis occasion so intense an ecchymosis and œdema as to simulate rapid gangrene. Small circumscribed tumors form, most prominent during erection, and result from the rupture of vessels in the cavernous bodies, forming hæmatomata. When the urethra is involved, blood will escape from the meatus, and inflammatory phenomena quickly develop.

Treatment.—Contusion may be treated by rest, elevation, and the application of hot antiseptic compresses. If the symptoms are progressive, an incision should be made under strict antiseptic precautions and the bleeding vessels ligated. Emphysema is a serious symptom and necessitates free incisions, as does the first sign of suppuration; thorough drainage in this instance is essential. Extensive swelling and discoloration should not occasion alarm unless there has been rupture of the urethra or the cavernous or spongy bodies.

INCISED WOUNDS.—Incised wounds, when slight, heal quickly when closed early. If, however, they are deep and the erectile tissue is involved, free hæmorrhage results, and the possible loss of the power of erection in the part anterior to the wound. When the penis is completely divided hæmorrhage may be so serious as to cause death unless quickly controlled.

Treatment.—All hæmorrhage is to be controlled by ligature, the venous oozing is checked by the simple apposition of the cut surfaces. If it cannot be so controlled, a hard-rubber catheter may be introduced into the urethra and a tight roller-bandage applied. Such remedies as have a tendency to prevent erections should be administered internally. No

matter how extensive the wound, an effort should always be made to suture together a divided penis.

When the urethra is divided, it should be sutured, and a catheter introduced through the urethra into the bladder to prevent the formation of a urinary fistula; it should be removed at the end of the seventh day.

PUNCTURED WOUNDS.—Like punctured wounds elsewhere in the body, infection is likely, and a severe inflammation usually results.

Treatment.—Whenever possible, all punctured wounds should be converted into incised wounds in order to prevent infection and permit of drainage from the bottom.

CONTUSED AND LACERATED WOUNDS.—These wounds are dangerous only when the tissues are devitalized to a great extent or the urethra involved. When extensive they are liable to be followed by loss of erectile power or distortion of the penis.

Treatment.—These wounds require treatment that will control the resulting inflammation. When the urethra is involved, a catheter should be passed through into the bladder and maintained in place for a week or ten days. Occasionally it may be impossible to pass an instrument from before backward. Under such circumstances it will be necessary to open the urethra behind the injury and pass the catheter from behind forward.

GUNSHOT WOUNDS.—Gunshot wounds simulate contused and lacerated wounds and are subject to the same complications. The bullet should always be removed.

FRACTURE OF THE PENIS.—This injury may happen during coitus, and from traumatism calculated to “break” a painful chordee. The injury consists in a

laceration of the corpora cavernosa, and is followed by an extensive hæmorrhage into the subcutaneous tissues and great swelling. The erection immediately disappears, and the part anterior to the injury is unnaturally movable. When the urethra is involved there is an escape of blood from the meatus, and infection is extremely likely to occur. After such an injury the power of erection in the part anterior to the injury is usually lost; this may interfere with coitus and cause permanent impotence.

Treatment.—Fracture of the penis may be treated either conservatively or radically. The injured organ may be surrounded with lead-water-and-laudanum solution and kept firmly pressed against the abdominal wall by means of a bandage. The penis may be incised, the clots turned out, the bleeding vessels ligated, and the rent in the capsule closed by sutures. A permanent catheter should be introduced and the entire penis covered with an antiseptic dressing held in place by a firm roller-bandage. The catheter should be removed at the end of forty-eight hours and a new dressing applied. Erections must be prevented by the free use of bromide of sodium or potassium and by keeping the bowels regular.

DISLOCATION OF THE PENIS.—This injury results from a severe blow to the penis when in a flaccid state, tearing the subcutaneous cellular tissue at its root, forcing the organ to become incarcerated in the subcutaneous tissue of the abdomen, scrotum, perineum, or thigh. The mucous layer of the prepuce, which should prevent this accident, usually gives way along the line of the coronary sulcus. The urethra is occasionally ruptured in the perineum.

There is intense pain, extensive subcutaneous hæmorrhage, and also bleeding from the meatus. Occasionally there

is urinary extravasation and abnormal position of the root of the penis.

Treatment.—The penis should be returned to its normal position by traction when possible, or by means of a hook introduced into the meatus. Failing in this, it is proper to make incisions to permit of sufficient manipulation that the organ can be reduced. Extravasations of urine should be opened and drained, and an external urethrotomy or perineal section performed. Unless reduced early, adhesions may form from which it is not always easy to free the dislocated organ.

Inflammatory Affections of the Penis.

—**PENITIS.**—An inflammation of the penis, which may be acute and due to gonorrhœal folliculitis, erysipelas, rupture of the urethra with urinary extravasation, and wounds; or chronic, due either to the rheumatic or gouty diathesis or to syphilis. It is also ascribed to old areas of blood-extravasation which have undergone organization.

When superficial, all the signs of inflammation are present associated with a rapid, inflammatory œdema. In the circumscribed variety the inflammatory symptoms are local and followed by the formation of a tumor, which finally softens, indicating pus-formation. The diffuse form is rapidly followed by gangrene.

The chronic variety is characterized by slow-growing, painless areas of induration scattered through the cavernous bodies. The erect penis is bent at the seat of induration, and erections are usually incomplete in that part anterior to the node.

Treatment.—In the acute diffuse variety early free and multiple incisions are necessary to prevent gangrene; drainage should be provided for, and antisepsis maintained. Where gangrene has al-

ready developed, the treatment should be that appropriate for gangrene in other parts of the body. When spreading slowly, hot antiseptic fomentations should be applied until the slough separates, and the remaining simple ulcer treated on general principles. In the rapid-spreading form of gangrene the sloughs should be cut away, and the raw surface left touched with the thermocautery. Circumscribed abscesses of the cavernous bodies should be opened early and thoroughly drained. The function of the penis may be somewhat interfered with after healing.

In the chronic form of the trouble little can be done. Iodide of potassium and other remedies indicated in rheumatism and gout should be administered internally, while locally mercurial or ichthyol ointment should be applied. Occasionally pressure with a fine-rubber bandage will bring about a cure.

LYMPHANGITIS.—Lymphangitis is always secondary to peripheral inflammation and may be simple or venereal in origin. The vessels feel like fine wires beneath the skin and usually lead to the nearest lymph-glands, which will be found enlarged. Occasionally small nodules form which may soften, break down, and ulcerate, leaving small fistulæ, which may persist for a long time. The condition must be distinguished from phlebitis by the smallness of the vessels, the fact that they are not in the median line, and the much lessened œdema.

Treatment.—Rest, elevation, and the application of evaporating lotions. When they are dilated without inflammation, pressure or the use of mercurial ointment may cause them to disappear, otherwise excision or a seton is required to bring about a cure.

PHLEBITIS.—This is a rather uncommon condition and is usually secondary

to diseases of the penis or urethra. There is usually considerable pain and œdema, and a quite large indurated cord is felt along the dorsum of the penis exactly in the median line. Occasionally suppuration takes place.

Treatment.—Rest, elevation, and the use of evaporating lotions or mercurial ointment are usually sufficient.

VARICOSE VEINS.—Varicose conditions of the veins is not uncommon and is of but little clinical significance, although they may occasionally be accompanied by a loss of power of erection. When large enough to prevent coitus, they may be ligated or excised.

BALANITIS AND POSTHITIS.—Balanitis is an inflammation of the mucous surface of the glans penis, and posthitis an inflammation of the mucous layer of the prepuce. As the two surfaces are usually attacked simultaneously the term balanoposthitis is used.

The predisposing cause is a redundant or phimotic foreskin. Because of the retained smegma and urine, the two mucous surfaces are kept constantly moist; they become more or less macerated, offering conditions most favorable for the development of micro-organisms. Diabetes is also said to be a predisposing cause. The exciting causes are irritations, abrasions, contact with endometrial discharges, and chancre, chancroid, gonorrhœa, and diphtheria.

Symptoms.—In the mild forms there is usually some burning and itching, the mucous membrane is red, somewhat thickened, and a sero-sanious pus escapes from beneath the foreskin or covers the surfaces as a milky secretion from which a very offensive odor is emitted. When the inflammation is more intense, superficial erosions and ulcers are seen about the corona. Croupous and diphtheritic varieties of inflam-

mations have been observed, the mucous layers being covered with a membranous coating; it is closely adherent, and the attempt to strip it off is followed by hæmorrhage. Among the complications are phimosis, paraphimosis, lymphangitis, and gangrene.

Treatment.—Balanoposthitis may be promptly relieved by cleanliness. The prepuce should be gently retracted, the parts washed freely with Castile soap and warm water twice daily, carefully dried, and dusted with equal parts of bismuth, boric acid, and calomel. It is usually a good plan to interpose a piece of gauze or lint, so that the two inflamed mucous surfaces will not come in contact with each other. Some surgeons prefer lotions or washes. A small piece of cotton is spread out over the surface of the glans penis and moistened with a solution of lead-water and laudanum, or with such a combination as the following:—

℞ Zinci sulph., 3 grains.
Plumbi acet., 6 grains.
Morph. sulph., 7 grains.
Aquæ, 2 fluidounces.

and the prepuce pulled forward over the glans. In the presence of erosion or ulcerations the entire mucous surface should be painted over with a solution of nitrate of silver (gr. xx to fʒj).

When complicated by phimosis, the inflammatory œdema must be counteracted by the frequent use of hot compresses, lead-water and laudanum, and subpræputial injections. As soon as the glans can be exposed, the ordinary local treatment as described above is indicated.

In cases of chronic balanoposthitis, or when there are frequent acute attacks, circumcision is to be recommended.

HERPES PROGENITALIS—A condition characterized by the sudden appearance of one or more vesicles on the balano-

præputial mucous membrane, surrounded with an erythematous area, and attended by an itching, burning pain.

The predisposing causes are catarrhal diathesis, neuroses, gout, rheumatism, and phimosis, and the exciting one is any irritation of the balanopræputial mucous membrane.

Symptoms.—Herpes usually appears suddenly as a cluster of vesicles surrounded by a red areola. These vesicles, at first containing a clear serum, which later becomes cloudy, finally dry up and scab over, leaving a bright-red spot. Occasionally the vesicles rupture, and a true ulcer results, which may become of large size when secondarily infected. Sometimes the lesions are accompanied by a slight burning pain; at other times the pain is intense and neuralgic in character. The pain may precede the development of the vesicles. The disease shows a marked tendency to recur and may occasion a polyganglionic, painless bubo.

Diagnosis.—Herpes must be distinguished from chancre, chancroid, and mucous patches. The chancre usually appears between the tenth and forty-second day; it is single; painless; begins as an erosion, papule, or tubercle; and is indurated, elevated above the surface of the surrounding tissue, shows little or no secretion, and usually disappears spontaneously. Chancroid appears within five days; it may be single, but is usually multiple from autoinoculability; begins as a pustule, always ulcerates, is punched out, secretes profusely, and is often painful. The mucous patch is always accompanied by other manifestations of syphilis.

Treatment.—The basis of all treatment is cleanliness. The parts should be frequently washed with warm water, and each vesicle touched with nitrate of silver

(gr. xx to f5j), and the application of such powders and lotions as are applicable for balanoposthitis. When the pain is neuralgic, a 4-per-cent. solution of cocaine or a drachm of chloral to the ounce of water may be applied. Constitutional treatment should always be directed to the correction of any existing dyscrasia. In recurrent herpes circumcision is the only means that will bring about a permanent cure.

Tuberculosis of the Penis.—Tuberculosis of the penis is an extremely rare condition. It may be periurethral, balanopræputial, and urethral. The disease, as in other parts of the body, is characterized by the formation of ragged, irregular, undermined ulcers, of very slow growth, and exhibiting little or no tendency to heal. The inguinal glands are often involved, and occasionally undergo caseous changes.

Treatment.—When seen early, they should be curetted, touched with pure carbolic acid, and dressed antiseptically with iodoform. Internally, remedies should be administered to correct the existing diathesis. In later stages amputation of the organ may be necessary.

Tumors of the Penis.—Tumors of the penis may be either benign or malignant, solid or cystic.

The benign tumors include cysts (mucous, sebaceous, or hæmorrhagic), adenoma, fibroma, horns, elephantiasis, papillomata, and vascular growths.

The malignant tumors include sarcoma, carcinoma, and epithelioma. With the exception of sebaceous tumors, cysts are rare; the former may occur in any region where sebaceous glands are present.

Adenoma and fibroma are exceedingly rare. Guitéras and Beck each report a case. They coincide completely with similar growths in other parts.

Horns springing from the glans have been reported by Brinton and others. They have the appearance of a nail, and when dry are smooth and polished.

Elephantiasis usually involves the penis and scrotum, which organs may attain large size. It is but rarely seen in temperate latitudes. It may result from wounds and diseases which obstruct the lymph-channels.

The treatment of this condition is unsatisfactory. Large doses of iodide of potash may be tried. Circumcision may be performed so as to remove as much of the thickened skin as possible.

Vascular growths are occasionally found along the dorsal vein and include angiomas and nævi.

The treatment of benign tumors of the penis is that appropriate for like conditions in other parts of the body: removal when increasing in size or interfering with function.

PAPILLOMATA, VENEREAL WARTS, OR VEGETATIONS, represent an overgrowth of the papillæ of the balanopreputial mucous membrane. They are usually due to repeated attacks of balanoposthitis superinduced by a redundant or phimotic prepuce in young men who are uncleanly. They are in no sense venereal in origin.

Symptoms.—Venereal warts appear as large or confluent, moist or dry, pedunculated or sessile papillary overgrowths, usually springing from the coronary sulcus, the glans penis, or the inner layer of the prepuce. The confluent warts often assume the shape of a cauliflower. They grow rapidly, are exceedingly vascular, and often attain large size.

A diagnosis must be made from syphilitic condylomata and epithelioma. Syphilitic condylomata are usually associated with other evidences of syphilis. Epithelioma appears late in life, grows slowly, and is markedly indurated.

Treatment.—When small and single, these growths may be destroyed by the frequent application of carbolic or chromic acid. When large, the penis should be covered with carbolized olive-oil (to protect it from acids), the warts rapidly cut away with scissors, going well down into healthy tissue and cauterizing the base with pure carbolic acid. A piece of lint or gauze saturated with a 25-per-cent.-boroglyceride solution should be held in place over the raw surfaces by a bandage. When large masses are removed it may be necessary to touch the base with the actual cautery in order to control the hæmorrhage.

MALIGNANT DISEASE.—With the exception of epithelioma, malignant disease of the penis is rare, although malignant tumors are much more commonly observed than the benign varieties.

Epithelioma of the penis may exist in the form of an ulcer or cauliflower-like growth. A redundant prepuce or phimosis predisposing to balanoposthitis, with consequent maceration, may act as a predisposing cause.

Symptoms.—The disease usually begins as an insignificant ulcer or wart, beginning most frequently at the preputial orifice or coronary sulcus. It grows slowly, and gradually infiltrates the surrounding tissue. The prepuce is finally destroyed, and an offensive, ichorous discharge covers the ulcer, which shows great tendency to bleed on the slightest manipulation. As the disease extends backward, the cavernous bodies become indurated, the skin adherent, and the inguinal lymphatic glands become enlarged and ulcerate.

There is usually no difficulty in making a diagnosis except in the very earliest stages. Under such circumstances a small section might be removed under

cocaine and a microscopical examination made.

Literature of '96-'97-'98-'99.

Epithelioma of the penis is mistaken chiefly for venereal sores. The growth is confined to the first inch of the urethra, while sarcoma may be located at any part. Two varieties are met with: the flat ulcer and the cauliflower growth. The condition is generally associated with phimosis and is very rare among Hebrews; there is generally foul-smelling, blood-tinged discharge and induration under the prepuce. The discharge should be examined under the microscope. Stained with methyl-blue, cells of large size with nuclear proliferation are seen. The growth tends to ulcerate through the prepuce. In nearly all cases it occurs after fifty, and its duration is usually over three months; in primary chancre the patient should have developed a rash within this time. J. Hutchinson, Jr. (*Lancet*, Apr. 22, '99).

The prognosis is exceedingly bad unless the growth is removed very early.

Treatment.—Amputation or extirpation of the penis, depending upon the amount of tissue involved, is indicated. The infected lymphatics from both groins should always be removed at the time of operation in order to prevent recurrence.

Amputation of the Penis.—Amputation of the penis is indicated for the relief of tuberculosis and malignant disease.

The operation may be performed either by the flap or circular method; the former, however, is to be preferred. Hæmorrhage is to be provided against by transfixing the root of the penis with two long pins, and surrounding the organ with an elastic bandage above. These prevent the ligature from prematurely slipping after the organ has been removed. The position and shape of the flaps is to be governed by the limits of

the disease. Whenever possible, a long anterior flap is to be preferred.

A narrow-bladed knife is introduced between the cavernous and spongy bodies at a point at least one inch behind the disease, and a small posterior flap is then cut forward and downward. From this flap the urethra is to be dissected free. A flap of sufficient length is cut from the dorsum and sides of the penis, reflected backward, and the cavernous bodies divided on a level with the line of reflection. The dorsal artery is now tied, the tourniquet removed, and any spurting vessels ligated with fine catgut. The stumps of the cavernous bodies are now covered by suturing together their fibrous envelopes (tunica albuginea). The anterior flap is punctured, the urethra drawn through it, slit up, and sutured in place. The two flaps are now united with silk-worm-gut sutures. A Nélaton catheter should be tied in place for a week, and then a meatal bougie passed at regular intervals to prevent contraction of the new urethral orifice.

Extirpation of the Penis.—Extirpation of the penis is indicated when malignant disease has extended as far back as the scrotum.

The patient should be placed in the lithotomy position, and the scrotum split along the entire length of the raphé. After exposing the anterior layer of the triangular ligament, the spongy body is dissected free and cut off, leaving sufficient to bring out through the perineal incision. With an elevator, the crura are dissected from the pubic arch; the incision is prolonged about the penis above, the suspensory ligament divided, and the dorsal arteries secured. The stump of the spongy body containing the urethra is now slit up, stitched in the posterior part of the scrotal incision, and the external wound is closed. A catheter should be

introduced into the bladder and retained in place for a week.

Diseases of the Testicles. ~

Anomalies.—**POLYORCHISM.**—Quite a number of cases have been reported of men who have three, four, or six testicles, but only in very few authentic cases has the anomaly been verified by post-mortem or operation. In some of the supposed cases tumors, hernias, and hydroceles have been found.

ANORCHISM.—Congenital absence of the testicles has been occasionally reported, but on dissection, in many of these cases, abdominal retention of the organs was noted. The condition is not so uncommon as a unilateral deformity (monorchism). The pelvic portion of the vas and the seminal vesicle are usually present, although the prostate is rudimentary on the corresponding side. In a true case of anorchism the voice does not change, there is no beard, sexual organs are rudimentary, and impotence is the rule. These facts might assist in distinguishing between abdominal retention and absence; as in the former, all the characteristics of the male sex are preserved. It may be sometimes difficult to distinguish absence from atrophy of the organs.

Treatment.—When the testicles are absent it might be possible to favor the proper development of the individual by injections or ingestion of the organic extracts (testicular).

SYMORCHISM.—Fusion of the testicle has been reported by Baillie and Schurig. In each instance two cords were found.

HYPERTROPHY OF THE TESTICLES.—The size of the testicle bears no relation to the size of the individual. Compensatory hypertrophy is believed to occur when one testicle has been removed. As large organs are more vulnerable than

the small, they should be supported by a suspensory bandage and the subject cautioned as to the dangers of urethritis.

ATROPHY OF THE TESTICLES.—True atrophy is always observed in cases of undescended testicle. Even in the normal position one or both may remain rudimentary. They often regain their normal size as the result of physiological activity. There is no reason to believe that prolonged chastity causes wasting of the organs.

But little can be done for these cases. Misplacements should be corrected, and massage may be tried.

UNDESCENDED TESTICLE.—The testicle may be arrested in any parts of its course in its descent from the kidney to the scrotum; when retained in the abdomen, it is termed cryptorchidism. It is sometimes found in the groin and in the perineum. The cause of these abnormalities has been variously attributed to small rings, a short cord, peritoneal adhesions, and loss of power or anomalous attachments of the gubernaculum.

Misplaced testicles, as a rule, are undersized, and there is a degeneration and atrophy of the secreting structure. They are often functionless, and sterility results. In some of the reported cases spermatozoa were found. When misplaced outside of the abdomen, the testicles are exceedingly liable to injury, and inflammations and malignant degeneration are common.

Diagnosis.—When the testicle is retained in the inguinal canal it must be distinguished from hernia, which can usually easily be done by noting the absence of the testicle from the scrotum, ovoid shape, irreducibility, and the sickening pain when pressed upon. When situated in the region of the groin, it may be confused with bubo, especially when orchitis is present. The same rules,

however, hold good as in the case of hernia.

Treatment.—When the organ still remains in the abdomen, nothing can be done by surgical intervention; its attachments, being necessarily short, would prevent its being dragged down into the scrotum. When situated in the inguinal canal, an effort should be made to bring it into the scrotum by daily traction, its return into the canal being prevented by the use of a truss having a very soft pad. If it cannot be drawn down into the scrotum by the sixth year, operation is necessary (orchidopexy). The gland is exposed by a free incision, and brought out of the wound, so that the fibres of the cremaster may be divided transversely. The cord is then gently stretched until the testicle hangs free beyond the external abdominal ring. The scrotum is now invaginated and fastened to the base of the testicle by three catgut or silk sutures. When the invaginated scrotum is drawn out, the anchored testicle is carried into its proper place. The deeper tissues are closed by catgut, and the tissues of the cord are sutured to the pillars of the external ring.

In the femoral variety of misplacement, the testicle should be returned to the abdominal cavity and held in place by a truss. In the perineal form, the operation for inguinal displacement can occasionally be carried out. When situated near the internal ring, it should be protected from injury by the use of an appropriate pad or truss.

When seen late in life, castration is always advisable, as the organ is probably functionally useless, and is liable to sarcomatous degeneration.

INVERSION OF THE TESTICLE.—The testicle may have descended to the base of the scrotum, and then assumed various faulty positions (anterior, lateral, hori-

zontal, and rotatory), the horizontal being the most common.

LUXATION OF THE TESTICLE.—The testicle may be luxated from its normal position by blows, muscular action, and sudden contraction of the cremaster. It usually becomes rapidly inflamed.

Treatment.—When seen early the luxation should be reduced by manipulation and traction, a pad being applied over the external ring. When adhesions have formed, as in old unreduced cases, the operation for undescended testicle may be required.

TORSION OF THE TESTICLE.—The cord of an undescended testicle may be twisted as the result of congenital malformations. The symptoms depend upon the amount of torsion. There is usually inflammation and possible gangrene. This condition must be distinguished from strangulated hernia and epididymitis. In torsion the epididymis is anterior, while in epididymitis it is posterior. In a hernia there is no impulse on coughing and obstructive symptoms are absent. Simple orchitis is to be distinguished by the normal anatomical arrangements of the parts.

Treatment.—When seen early the torsion is to be reduced by manipulation and lead-water and laudanum applied, with elevation and rest in bed. After adhesions have formed the testicle and cord must be exposed, the twist reduced, and the testicle secured in proper position by a few sutures on one side. Gangrene requires castration.

Injuries of the Testicle.—When normally situated, the testicle is not often injured. Contusion from kicks, blows, and bruises upon the saddle are not uncommon. There is usually an acute sickening pain, often faintness or syncope, followed by rapid swelling. An hæmatocele or inflammation may ensue, followed

by hydrocele and fibroid changes in the organ.

Incised, punctured, and gunshot wounds are occasionally met with, and require the same treatment as similar wounds of other parts of the body. Such wounds usually do well, and castration is seldom or never called for.

Orchitis.—An inflammation of the testicle is caused by gonorrhœa, mumps, tuberculosis, syphilis, and traumatism.

Symptoms.—The symptoms of the simple inflammatory variety are as follow: Dull, sickening pain, radiating toward the hips and back; the testicle rapidly swells, but retains its ovoid form. Occasionally an acute hydrocele develops, and as a result there is an increase in swelling and pain. Occasionally supuration takes place.

Diagnosis.—Orchitis must be distinguished from epididymitis, which can be readily done by noting the position of the tenderness, this being posterior when the epididymis is involved.

Treatment.—The patient should be confined to bed, the scrotum elevated, and applications of lead-water and laudanum made. The bowels must be kept open and the pain controlled by morphine. In the presence of an acute hydrocele, puncture of the tunica vaginalis with a fine tenotome will often instantly relieve the pain. After the acute symptoms have subsided resolution may be hastened by strapping or the application of mercurial and belladonna ointments. Should an abscess form, it should be opened early, and treated on general principles.

TUBERCULAR ORCHITIS.—Tubercular orchitis is usually secondary to a like affection of the epididymis; the organisms, however, may reach the gland through the blood, and a primary focus develop. The disease is often bilateral,

and is most commonly met with between the ages of twenty-five and thirty-five.

Symptoms.—The organ becomes hard, knotty, and irregular; there is a feeling of dragging weight and a sense of discomfort referable to the back. Sooner or later inflamed tissues become adherent to the skin, soften, break down, and rupture spontaneously, leaving fistulous openings, which exhibit little or no tendency to heal. There is little or no pain in the early stages of the disease. Not infrequently the disease has been preceded by tuberculosis of the lungs. Tubercular testicle must be distinguished from syphilitic orchitis. The syphilitic is uniform, hard, painless, and seldom or never suppurates.

In not a few cases resolution takes place. The disease may become capsulated and cause no further trouble. In bad cases it may involve the epididymis, vas, prostate, and bladder.

Treatment.—The routine treatment consists in the internal use of iodide of iron and codliver-oil, with good food, fresh air, and sunlight. Locally, the part should be kept at rest, and iodide-of-lead ointment applied. Should the disease progress, injections of chloride of zinc, from 3 to 5 drops of a 1-per-cent. solution, may be made around the periphery of the focus every third or fourth day. A 10-per-cent. emulsion of iodoform and glycerin may be used in the same manner, from 20 to 30 drops being used at each injection. When the disease is circumscribed, it may be curetted and touched with pure carbolic acid. Such a procedure will destroy the function of the organ. Castration is indicated when other measures have failed.

METASTATIC ORCHITIS.—This is a frequent complication of mumps. One testicle is usually involved, and atrophic changes are exceedingly common. The

symptoms and treatment are similar to acute orchitis.

SYPHILITIC ORCHITIS.—This condition usually occurs as a complication of the third stage of syphilis. The testicle is hard, indurated, somewhat irregular, and painless. Both testicles are often involved.

Treatment.—Mixed treatment, biniodide of mercury, $\frac{1}{12}$ grain, with 20 grains of iodide of potassium, should be administered thrice daily. Locally,unctions of mercurial ointment should be used.

Tumors of the Testicles.—Tumors of the testicles are rather uncommon, but cysts, adenomata, fibromata, chondromata, myxomata, carcinomata, sarcomata, and dermoids are occasionally met with. Cancer is by far the most common tumor affecting the testicle.

SYMPTOMS.—Carcinoma is usually unilateral, making its appearance about middle life as a uniform swelling, which grows rapidly, becoming nodular and irregular, and quickly breaking down and ulcerating, leaving a protruding fungous mass. As the disease progresses, the inguinal lymphatics become involved and also the lumbar. The general health rapidly fails, the face becomes cachectic, and the body emaciated.

In the last stages cancer might be mistaken for tubercle. However, the age, rapid growth, and ulceration would all point to malignant disease.

TREATMENT.—Early and complete extirpation is alone indicated.

Literature of '96-'97-'98.

Case of a man, aged 60, whose right testicle had been removed for sarcoma, of which microscopical sections were obtained. Three weeks later the stump fungated, and a large mass was removed, with as much of the cord as possible. In another three weeks there was infil-

tration in all the surrounding skin. Morris unhesitatingly pronounced it malignant, but suggested arsenic in rapidly-increasing doses. In ten days, when the poisonous dose had been reached, the growth had entirely disappeared. That was three years ago, and there has not been any recurrence. Golding-Bird (Med. News, Jan. 9, '97).

In radical operation for malignant testicular disease the testicle and its coverings, half of the scrotum with the septum scroti, the cord as high as the internal ring, and the inguinal glands and fat should be removed. Stimson (Med. Rec., Oct. 30, '97).

Hydrocele.—This is a collection of fluid in the tunica vaginalis. It may be acute, as the result of extension of inflammation from either the epididymis or testicle; congenital,—the result of anatomical deficiency in the vaginal and funicular processes; or it may be encysted. In many cases, however, the cause is not appreciable, although it is probable that traumatism and strains may favor its development.

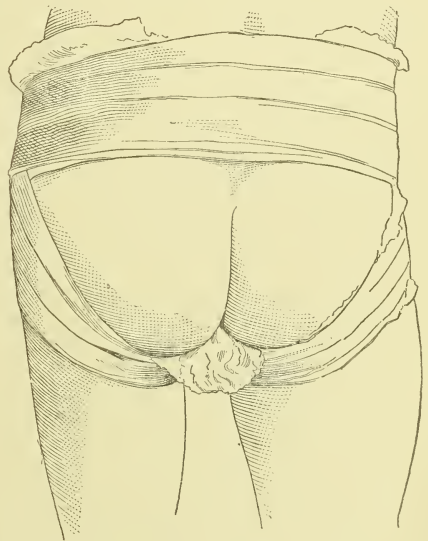
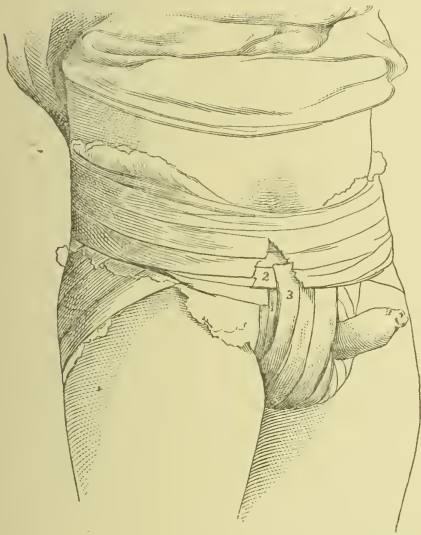
In the acute variety of hydrocele, owing to the prominence of the symptoms of the primary condition, the characteristic symptoms are not pronounced. Pain is agonizing and is due to pressure. In the encysted form swelling, of slow formation, beginning at base of the scrotum and which is pyriform in shape, smooth, tense, fluctuating, and elastic on pressure, is noticeable; this does not, however, alter the size of the organ, which is dull on percussion, stands away from the body, and cannot be reduced. In the congenital variety the swelling is also of slow formation, dull on percussion, filling from below; it disappears when the patient assumes the recumbent posture, but returns slowly when he is in the erect posture. Such hydroceles are frequently complicated by hernia.

Diagnosis.—Hydrocele must be dis-

tinguished from hernia, varicocele, and hæmatocele. This can usually be done by the "light test." The patient should be examined in a dark room; a candle or lamp is held close to the scrotum, by looking through the scrotum toward the light the swelling will appear translucent. This test may fail in thick-walled sacs.

A small incandescent electric lamp used to detect the fluid in obscure hydroceles. When a suspected hydrocele is presented, the mouth of the tube is pressed firmly against the tumor on the side opposite to the operator and the

In the encysted variety treatment may be either palliative or radical. The palliative consists in tapping with trocar and cannula, drawing off the fluid, repeating the operation as often as the sac refills. In tapping a hydrocele the swelling is made tense, and the trocar is plunged in with a firm, quick, boring motion, being careful not to wound the testicle. A spot should always be selected on the scrotum free from veins, so as to avoid the possibility of hæmorrhage into the loose cellular tissue.



Compression bandage for scrotum. (Wickham.)

(La France Médicale.)

lamp turned on, when the entire tumor, if fluid, will be rendered luminous. The light is very powerful, and in most cases the testicle can be readily mapped out and definitely located. W. K. Otis (Jour. Cut. and Genito-Urin. Dis., Dec., '93).

Treatment.—In the acute form rest in bed, elevation of the scrotum, and application of lead-water and laudanum are indicated. When the pain becomes very severe, the sac may be punctured. After the acute symptoms have subsided, a well-fitting suspensory should be worn.

The radical treatment may be carried out either by injections of irritating fluids, or cutting operations. In the injection method, pure tincture of iodine is thrown into the sac after the withdrawal of the fluid. From a drachm to an ounce may be used, according to the capacity of the sac. This method is especially valuable in thin-walled hydroceles.

Carbolic-acid injections by Levis's method tested in over 30 cases of hydrocele, with known results in 27: cure in 21, relapse in 6, all of which latter were cured by a new injection except 1. In

1 case, of hæmorrhagic diathesis, there were serious symptoms from swelling of the serotum with blood, calling for the radical incision. Helferich (*Ther. Monats.*, Mar., '89).

[I have also employed carbolic acid uniformly in all cases of uncomplicated hydrocele and in a few that were complicated, since reading Levis's article, and have yet to note a single failure. E. L. KEYES, Assoc. Ed., *Annual*, '90.]

In treatment of hydrocele, introducing, under antiseptic precautions, a cannula, which is left in for drainage for two days, advocated. During this time the parts are enveloped in antiseptic absorbent dressings. The cannula is then removed, and in from seven to nine days the sac is obliterated by an adhesive inflammation of the walls. Neumann (*Fortschritte der Med.*, No. 20, '93).

Hydrocele-sac should be washed out with a 2- to 3-per-cent. solution of antipyrine, which causes sufficient anaesthesia to render the iodine injection painless and which also has the advantage over cocaine of not being toxic under any circumstance. Pousson (*Revue Inter. de Méd. et de Chir.*, Sept. 25, '95).

Literature of '96-'97-'98.

In treatment of hydrocele by injection of solution of mercuric chloride, fifteen cases were cured with one injection; in two cases a second injection was necessary. Field of operation is made aseptic, the sac is tapped, the fluid is drawn off, 15 minims of a solution containing 1 grain of bichloride of mercury and 1 ounce of water are injected, this solution remaining in the sac of the hydrocele. In about forty-eight hours after injection fluid has reaccumulated, but on third day this accumulation begins to be absorbed and patient soon recovers. Miller (*Lancet*, Sept. 4, '97).

Treatment of simple hydrocele by puncture and injection of a solution of corrosive sublimate of strength of 1 to 1000 recommended. In a couple of weeks fluid entirely disappears. A puncture is made and corrosive-sublimate solution is injected twice, and lastly a solution of boric acid is injected. Etienne (*Gaz. des Hôp.*, Jan. 8, '98).

The cutting operations include the open method and removal of the parietal layer of the sac. In the former the tissues of the serotum and sac are incised, the sac sutured to the skin to prevent adhesions, and the cavity of the tunica vaginalis packed with iodoform gauze to promote healing from the bottom. In the latter the parietal layer of the sac is removed through an incision of sufficient length, and the wound closed. These methods are preferable when the iodine method has failed or when the wall of the sac is thick.

Nineteen hydroceles perfectly cured by slitting up the serotum and tunica vaginalis by an incision an inch long, stitching the tunica vaginalis to the serotum, and applying an antiseptic dressing. Cavity was not injected nor interfered with in any way. Lieutenant-Colonel Hall (*Brit. Med. Jour.*, Apr. 8, '93).

Congenital cases can occasionally be cured by the application of a truss. If this fails, an antiseptic seton will usually prove successful.

Spermatocele.—A collection of milky fluid in the tunica vaginalis containing spermatozoa gives rise to symptoms similar to hydrocele. The treatment is the same as that for the latter disorder.

Hæmatocele.—This is a collection of blood in the tunica vaginalis, which may either be due to traumatism, disease, or occur as a sequel to the tapping operation for hydrocele.

The serotum assumes a globular shape, the largest circumference being below. The tumor does not fluctuate and does not transmit light. Being abnormally heavy, it is unusually low.

TREATMENT.—Rest in bed, elevation of the serotum, and the application of lead-water and laudanum are first indicated. After the acute symptoms have subsided, the serotum should be strapped. When these measures fail, the tunica

vaginalis should be opened, all clots turned out, and an iodoform-gauze packing introduced.

Epididymitis.—Inflammation of the epididymis may be inflammatory, syphilitic, and tubercular. It commonly results from the extension of gonorrhœal inflammations from the posterior urethra through the sac, but is sometimes due to syphilis and tuberculosis.

SYMPTOMS.—These are of the inflammatory type: tenderness along the cord, hard swollen vas, and pain in the back. The testicle rapidly swells, and becomes exceedingly tender, the patient walking with a stooping posture and the legs wide apart. On examination the tenderness and swelling will be found confined to the posterior part of the scrotum. An acute hydrocele by contiguity may result. Suppuration is rare, the general tendency being always toward resolution. Traces of the attack often remain for a long time after the inflammation has subsided, the regular outline of the organ being interrupted by masses of lymph.

The *syphilitic* variety is usually noted as a complication of the secondary period, and consists of small, gummatous lesions.

Literature of '96-'97-'98.

Four cases of tertiary syphilitic epididymitis seen during past year, three of which came under treatment for hydrocele, and each patient had been tapped two or three times. In each case there was gumma of the epididymis. In two of the cases primary infection had occurred ten years before, and a third said nineteen years had elapsed since the primary infection. In one case the cord was also involved. In three of the patients the disease was unilateral. In fourth case was presented enlargement of one testicle without involvement of epididymis; on opposite side both epididymis and testicle were affected. C. G. Cumston (Boston Med. and Surg. Jour., Apr. 22, '97).

The *tubercular* variety may be primary, but is often secondary to that of the testicle or prostate. The disease usually begins in the head of the organ as a series of nodules, of slow growth, which become adherent to the skin, soften, and leave a fistulous opening. This form is usually followed by sterility on the affected side.

TREATMENT.—In the simple inflammatory form rest in bed, elevation of scrotum, and lead-water and laudanum are indicated. When the pain is severe, the acute hydrocele may be punctured. After the acute symptoms have subsided, the testicle should be strapped and small doses of iodide of potassium should be given internally to favor resolution.

Dry poultice, which consists of cotton-wool with an outer layer of impervious rubber tissue, advocated as a packing for testicle in acute epididymitis. G. E. Brewer (Jour. of Cut. and Genito-Urin. Dis., Jan., '92).

Literature of '96-'97-'98-'99.

In blennorrhagic epididymitis the scrotum should be cleansed with soap, and the following ointment applied with a layer of cotton supported by a suspensory bandage:—

R̄ Guaiacol, 45 grains.

Vaselin, 450 grains.

Janowski (Indépendance Méd., May 3, '99).

The syphilitic form requires the mixed treatment internally, combined withunctions of mercurial ointment. The tuberculous type is met by the measures indicated in tuberculosis of the testicle.

Where operation is needed, in the case of tuberculosis of the epididymis, it is only necessary to remove the offending epididymis, the testicle being left undisturbed. H. Mynter (Annales of Surg., Apr., '93).

Castration.—The operation for the removal of the testicle is indicated when tumors, tuberculosis, gummata (occasion-

ally), or extensive suppuration are present, or for the relief of enlarged prostate and certain cases of undescended testicle.

OPERATION.—The testicle being made prominent, an incision is made from the base of the scrotum to the external ring. When the skin is involved, two elliptical incisions should be made. The testicle, with its tunics, is now quickly freed and the cord exposed. While traction is being made, a double catgut ligature is passed through the cord with an aneurism-needle, the loop cut, and the needle withdrawn. The cord is then ligated in each half and once around, and divided one-fourth of an inch below the ligature. The stump is cauterized with pure carbolic acid to prevent infection of the wound from the vas. All hæmorrhage being controlled, the wound is closed by silk-worm-gut sutures, the operator being careful to evert the skin-edges.

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PENTAL.—Pental (trimethyl-ethylene or beta-iso-amylene) is a colorless, inflammable liquid, insoluble in water, but miscible in all proportions with alcohol, ether, and chloroform. It does not decompose on exposure to light and air. It was discovered and described by Balard in 1844 and used in 1856, after which it dropped out of sight. Toward the end of 1891 it was resurrected by von Merling, and its use advised as an anæsthetic for dental and minor surgical operations, in doses of 2 to 3 drachms by inhalation, or applied as a spray for local anæsthesia.

Physiological Action of and Poisoning by Pental.—Pental is, according to the experiments of Wood and Cerna, a dangerous cardiac depressant, and therefore a most dangerous anæsthetic. Untoward symptoms—such as excitability, tremors, difficulty of speech, headache, erythem-

atous eruptions, and even convulsive movements—have been reported as sequelæ of pental anæsthesia. Albumin, casts, and blood have been found in the urine after its use. Temporary cessation of respiration with cyanosis is not infrequent during its administration, and Cheyne-Stokes respiration has been observed. The circulation has been much embarrassed through its depressing action upon the heart, and death has ensued from respiratory and cardiac paralysis.

Treatment of Poisoning by Pental.—The treatment of poisoning by pental is similar to that of chloroform poisoning. If the drug has been swallowed, the use of an emetic or stomach-siphon to evacuate the stomach and subsequent stimulation are indicated. If pental has been inhaled, with the first dangerous symptoms it should be instantly discontinued and fresh air admitted. Water may be dashed on the face, the tongue pulled out, artificial respiration practiced, the galvanic current applied, and an hypodermic injection of $\frac{1}{30}$ grain of strychnine given, as quickly as possible. Death by this agent is often so rapid that treatment is of no avail.

Therapeutics.—The principal use of pental is that of producing general anæsthesia, especially for short operations. It is only mentioned in this work to emphasize its dangers and to emphatically condemn its use as an anæsthetic. Prince Stallard has shown that the fatality of this agent has been 1 out of every 164 administrations. T. J. Walker has rightly protested against its further employment, this proportion of deaths being one hundred times greater than that of any other anæsthetic.

PENTANE.—Pentane, or amyl-hydride, is a fluid preparation obtained

from coal-tar or petroleum. It occurs as a colorless, inflammable liquid, having a pleasant, fruity odor, and is soluble in alcohol.

Pentane is an hydrocarbon (C_5H_{12}), the fifth in number of the paraffin series.

It was proposed as an anæsthetic and is said to act without causing irritation or dyspnœa, but it has not been sufficiently used to insure its recommendation.

PEPSIN.—Pepsin (pepsinum, U. S. P.) is a proteolytic ferment obtained from the glandular layer of fresh stomachs from healthy pigs, and capable of digesting not less than 3000 times its own weight of freshly coagulated and disintegrated egg-albumin, when combined with 1000 times its weight of a 2-per-cent. solution of hydrochloric acid and maintained for six hours at a temperature of not less than 100.4° F. or more than 104° F., the vessel in which it is contained being gently agitated every fifteen minutes. At the end of the given time little or no residue should be observed, but a few thin flakes of the coagulated albumin need hardly be regarded. Pepsin occurs in yellowish-white or white scales or in powder, having a slight acid or saline taste and should be free from odor. Much of the commercial pepsin is adulterated or contaminated with peptone, and may also contain mucus and albumin. The presence of peptone is manifested by its peculiar musty odor, and, if it be present in large amount, it will absorb moisture and become sticky when exposed to the air.

Preparations and Doses.—Pepsinum, U. S. P. (pepsin, 1-3000), 1 to 10 grains.

Pepsinum saccharatum, U. S. P. (saccharated pepsin, 1-300), 5 to 30 grains.

Besides the officinal preparations, there are others on the market which may be

preferred. Essence of pepsin (1 to 4 drachms), glycerole of pepsin ($\frac{1}{4}$ to 1 drachm), the liquor pepsini, U. S. P., 1880 (1 to 4 drachms), pepsin cordial (1 to 2 drachms), and wine of pepsin (1 to 4 drachms) are available fluid preparations.

Physiological Action and Therapeutics.—The terms "peptonized" and "peptone" are so fixed in the popular mind in association with pepsin that many continue to regard a peptonized food as one made with or containing pepsin. Pepsin is not available for peptonizing food for the sick in the household. Its action is not only restricted to albuminous (proteid) substances, but, acid being indispensable, the product is, for this reason, unsuitable as a food. In the laboratory it may be used and is used, for there the acids are removed and the products are properly clarified. Pepsin is useless in the artificial digestion of milk. Pepsin cannot be used for the artificial digestion of food at the table in the way that pancreatic extract may be.

Literature of '96-'97-'98.

Pepsin, even in large quantities, has no inhibitory action on lactic-acid fermentation, and whatever inhibition is exerted by native or artificial gastric juice depends on the hydrochloric acid. Combined hydrochloric acid in large quantities also exerts such an action. Even on other forms of fermentation pepsin has no hindering influence of any importance; at least, none that can be compared with the antibacterial action of hydrochloric acid. L. Aldor (Berliner klin. Woch., July 25, '98).

In using pepsin, or other digestive ferment, certain points should be observed, lest the ferment become inert before ingestion. A digestive ferment should never be mixed with water or any fluid of a higher temperature than can readily be borne by the mouth. In the pepton-

izing process, in sprays, in surgical solvents, too high temperature should be avoided. Pepsin is destroyed in alkaline solutions (with lime-water, sodium bicarbonate, aromatic spirit of ammonia, etc.). All ferments in solution soon decompose unless in the presence of an antiseptic. The ferments should not be mixed undiluted with strong, alcoholic tinctures or astringents. Pancreatic ferments should not be placed in acid mixtures. Pepsin and pancreatic ferments should not be mixed together in solutions, acid or alkaline. These mixed ferments cannot be permanently held in an active form in any solution. (Fairchild.)

Pepsin is best given with or immediately after food (as its digestive action is solely expended upon the proteids, which action takes place at once in the stomach), combined with hydrochloric acid (as the presence of the acid converts any pepsinogen in the gastric tubules into pepsin), as an aid to weak digestion. Pepsin is useful in atonic dyspepsia, especially in that present during convalescence from acute diseases. Gastric irritability is relieved by pepsin combined with bismuth in powder (bismuth in solution is incompatible with pepsin).

Pepsin is of value in gastralgia, pyrosis, gastric catarrh, and infantile aepsia. In gastric ulcer and in carcinoma of the stomach pepsin relieves the vomiting and assists the impaired digestive organs.

Pepsin is an efficient digestive ferment only in proteid indigestion. It is useless in intestinal indigestion, as it has no solvent action upon fats or starches. As a remedy for indigestion, pepsin is much inferior to pancreatin (pancreatic extract) or papain.

In INFANTILE DIARRHŒA arising from indigestion pepsin is a useful adjunct to other treatment; essence of pepsin given in doses of 10 to 30 drops immediately

after nursing will assist in the digestion of the milk-curds. In this disorder peptonized milk will give better results than pepsin.

In TYPHOID FEVER 5 grains of pepsin combined with 10 drops of dilute hydrochloric acid, given in a wineglassful of water, after nourishment, three times daily, will be found useful in assisting the impaired digestive powers and in controlling the febrile movement.

SURGICAL SOLVENT.—Pepsin will dissolve blood-clots in the urinary bladder, and render their expulsion easy. Pepsin has been used in diphtheria and membranous croup to dissolve the false membrane. For this purpose it may be applied in powder by insufflation, or in solution by spray or applicator (brush or probang).

Pepsin has been used as a local application to cancers and sloughing ulcers, with the view of removing sloughs and dead bone; and to abscess-cavities and sloughing wounds to remove the dead tissue and bring about a clean, healthy condition. Glycerole of pepsin is best fitted for this use, although the dry powder or scales have been successfully employed for this purpose.

Case of a machinist who received burn of the third degree. This was at first treated with carron-oil and next day with iodoform gauze. At the end of three or four days the wound was covered with a dirty-whitish purulent secretion with raised edge. Some places were curetted. Pepsin was then sprinkled over the arm and the whole surrounded by a gauze bandage. At end of four days this was removed and wound-surface was studded over with healthy granulations, and here and there new patches of epidermis had commenced in this short time to develop. Wound was then again cleaned with antiseptics and another sprinkling of pepsin applied. At the end of about twelve or thirteen days the whole arm was healed and there was

no scar-tissue. Patient was anæmic and suffering from *tabes dorsalis*. O. Waterman (*Ther. Monats.* xiii, p. 30).

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PERICARDIUM, DISEASES OF THE. Pericarditis.

Definition.—Inflammation of the serous covering of the heart, the result of primary or secondary infection.

Symptoms.—The subjective symptoms may vary greatly in severity. In mild cases the disease may call no attention to itself, and its discovery can only be made, if at all, by means of careful physical examination.

In severer cases there is uneasiness or pain in the cardiac region, with moderate fever and a general feeling of bodily distress. An important symptom is shortness of breath. There may also be palpitation, tenderness of the præcordial region, and a dry cough. As fluid accumulates in the præcordial sac, the symptoms change correspondingly, the heart's action being more embarrassed (especially its diastole), the dyspnœa and sense of anxiety increasing, yet pain, on the other hand, diminishing. In young children pain is usually absent. It has been stated that the pain is greater in pericarditis with effusion than in merely fibrinous pericarditis. This statement applied, so far as regards cases with effusion, to the time before the effusion develops.

The pulse at first is apt to be rather forcible; in later stages it becomes irregular, intermittent, and of low tension. The disturbance of cerebral circulation is shown by wakefulness, headache, and in severer cases dullness, delirium, or even melancholia. Rare complications are chorea and epilepsy.

Great distension of the pericardial sac may occasion dysphagia, which may be

lessened if the patient is raised into a sitting posture or bends forward. Sometimes the difficulty in swallowing appears to be due merely to nervous disturbance. There may likewise be vomiting, of nervous origin, because of irritation of the recurrent laryngeal nerve. Balfour warns us that the occurrence of delirium in the course of rheumatic fever ought at once to direct attention to the heart.

As regards objective symptoms, the disease may, as already said, run its course without directing the patient's attention to its existence; likewise the disease may escape the persistent and assiduous efforts of the physician to discover it. In general appearance the patient is apt to be anxious, distressed, and of a dusky countenance.

Before any effusion has accumulated in the heart-sac there may be tenderness on friction over the cardiac area; there is not apt to be great enlargement of the heart, although it may become somewhat dilated. In the early stages of the disease the heart's impulse is somewhat exaggerated, but later it becomes feeble. The veins of the neck may be distended or may even display pulsation. If there is considerable effusion, the præcordia may be somewhat prominent, especially in children, and the intercostal spaces raised so as to be on a level with the general surface. Sometimes the affected region exhibits œdema, particularly when there is pus.

On palpation it may be possible to detect friction. The apex-beat may be felt in its normal condition. As an effusion collects, the apex becomes less easily palpable, and finally disappears. Sometimes, however, it will be discovered if the patient can bend forward, thus causing the heart to approach again more closely to the chest-wall.

Gibson states that "the vocal fremitus

over the sternal region loses some of its intensity, and even fluctuation has been observed." As fluid collects in the sac, the area of cardiac dullness increases in every direction. The classical description of the shape of the dull area is that it resembles a triangle, or a pear hanging by its stem, with its base at the lower part of the chest. These shapes are more often exhibited by large than by moderate effusions. The extension of the dullness upward and to the right is quite constant. It is possible that adhesions may modify the position of the fluid. Sears, for example, mentions a case in which the heart lay against the anterior chest-wall, and about half a pint of pus had collected behind the organ.

There are three characteristic points about the enlarged area of dullness: (*a*) The apex-beat, as determined either by palpation or auscultation, is found to lie an inch or two within the left border of dullness. (*b*) The cardiac impulse is feeble and difficult of appreciation, which would not be the case if the extensive dullness were due either to hypertrophy or dilatation of the heart itself. (*c*) The normal heart-sounds are feeble and distant, while *perhaps* the radial pulse is comparatively strong.

A large collection of fluid may affect the pulse in a peculiar way, which, although not pathognomonic, is of considerable value. The "paradoxical" pulse, as it is called, varies with the cycle of respiration, becoming weaker or imperceptible during inspiration.

The distinctive auscultatory sign of pericarditis is the friction-sound. This may be heard over any part of the heart, more frequently, however, at the base than at the apex. It is near the ear, increased by gentle pressure with the stethoscope, and is described in various cases as rubbing, grating, or creaking;

it is apt to be somewhat harsh and it may be interrupted, or "jerking." It may be systolic or diastolic in time, more often it is a double murmur, and it may be triple. In any case it is not apt to be exactly synchronous with the systole and diastole of the heart. In this respect, as well as in its nearness to the ear, it differs from the endocarditic murmurs, and it also differs in the limited area over which it may be heard.

The pericarditic friction is not transmitted so far as are valvular murmurs. Friction may not be heard when the patient is lying horizontally, and become audible when he sits or bends forward. Sometimes it is heard inside the angle of the left scapula. The intensity of the friction is influenced by respiration, being usually louder during inspiration.

The heart-sounds proper are feeble and distant, or they may be drowned by the friction-murmur. Cases which present both endocardial and pericardial murmurs are naturally perplexing.

Certain accessory signs in the lung remain to be mentioned. In the case of large effusions the percussion-sound in the left axilla at about the level of the nipples is a muffled tympany; posteriorly below the angle of the left scapula the compressed lung may give a slight dullness on percussion and bronchial breathing.

The rapidity of the process varies greatly. Sometimes a dry pericarditis lasts but few days; a rheumatic pericarditis may cause a rapid effusion of sero-fibrin, so that in forty-eight hours the sac will be much distended; and in other instances there is a gradual increase of fluid for several weeks.

In septic cases pus develops rapidly, and death may ensue in three or four days. Rheumatic cases usually pursue a favorable course, and seldom demand

active interference. On the other hand, when the pericarditis complicates pleurisy, pneumonia, valvular disease of the heart, or chronic nephritis, life is in great danger. Tubercular pericarditis is almost absolutely hopeless, although it may pursue a chronic course.

Diagnosis. — From what has already been said it follows that in some instances pericarditis cannot be diagnosticated, subjective and objective symptoms both failing. Other cases are self-evident. In a third class of cases we have the possibility of confusion with endocarditis; hypertrophy, or dilatation of the heart; myocarditis; and localized pleurisy.

The endocarditic murmurs are apt to be localized at places corresponding with the valves of the heart, and to be transmitted farther than friction-sounds. They are, moreover, synchronous with the heart's movements, and they usually have a softer, blowing, and distant character, which contrasts with the harsher sound, near the ear, of pericarditis.

The hypertrophied heart is usually easily distinguished from pericarditis; the impulse is vigorous, the heart-sounds loud, and the outline of dullness is, although greater than in health, yet approximately normal in shape.

Certain cases of dilatation of the heart are perplexing, especially where the pericardial friction-sound has been heard within a short time previous. The observer is obliged to consider carefully whether the enlargement of the cardiac area of dullness and the feebleness of the heart-sounds are due to change in the heart-wall or to an effusion outside of it.

In dilatation the heart-sounds are clear, and the first sound of the heart may be, although valvular, quite strikingly distinct. The apex of the heart is never displaced upward by mere dilatation.

The cardiac impulse is often extensive in cases of dilatation, although giving the impression of feebleness and irritability, and the area of dullness is rather more quadrilateral than pyramidal, although, it must be confessed, too much stress cannot be laid on this distinction.

The importance of dullness in the fifth right intercostal space in the diagnosis of early pericardial effusion, as pointed out by Rotch, confirmed by clinical observations on forty-nine cases of pericarditis. Pericardial effusion, as a rule, can be first detected by the appearance of dullness at the right edge of the sternum in the fifth intercostal space. The dullness is more marked than the partial liver-dullness which is met with in health in the fifth right interspace; the dullness due to the effusion is absolute or almost absolute. Ebstein (*Virchow's Archiv*, B. 130, H. 3, '92).

A rough systolic murmur simulating that of pericarditis may be heard at the base in case of chlorosis, but usually the two diseases can be distinguished without difficulty.

Considerable stress in point of diagnosis has been laid upon the fact that pericardial murmurs become more distinct when the patient sits up in bed, but it should be borne in mind that similar changes are not infrequently demonstrable in the case of endocardial murmurs.

Literature of '96-'97-'98.

In pneumonia, and in pleurisy accompanied by pericarditis, the diagnosis of the latter is sometimes impossible. Of 57 cases of pneumonia under personal care during the past three years, 20 have come to autopsy. In 13 of these pericarditis was found; in 5 the pericarditis was detected during life; in the other 8 it was carefully sought for, and the absence of its signs was recorded.

Hydropericardium, with or without inflammation of the sac, in nephritis and cardiac insufficiency, may be masked by hydrothorax, ascites, passive congestion

of the liver, and other results of hydræmia and stasis.

In pericarditis pain in the cardiac region is very frequently absent, often it is slight; it is most marked in the relatively vigorous persons suffering from a mild primary disease. The less severe the original disease, the more likely are symptoms suggestive of secondary pericarditis to be present.

The diagnosis must rest mainly on physical signs, but these may be entirely absent. Friction is often evanescent, and may come and go between examinations which are separated by too long an interval. Another source of fallacy is the pleuro-pericardial friction. If there is no other evidence of disease in the lungs with which pleurisy is apt to be associated, and no other evidence of pleurisy than friction within the pericardial limits, the chances are in favor of the pericardial origin of the friction, especially in the rheumatic cases.

Conversely, with other evidences of pleurisy, or of a cause for it, a friction in the above area is probably pleural. Change of the percussion-sound upward or laterally, with change in the position of the patient, is a valuable sign. Pulsus paradoxicus observed in 5 out of 8 cases. F. Shattuck (Boston Med. and Surg. Jour., July 8, '97).

Diagnosis is difficult in those cases in which a friction-murmur has never been detected. If, however, the patient's condition becomes threatening, and the possibility of a considerable effusion exists, it is a proper and comparatively safe measure to insert an hypodermic needle, with aseptic precautions, so as to see whether fluid can be obtained. Perhaps the best point to choose for this purpose is the fifth left intercostal space, an inch and a half from the edge of the sternum. Shattuck, and also Strümpell, recommend the lower left part of the pericardial sac, a little way inward from the margin of dullness. Another place is the left costo-xiphoid angle: a spot which is probably perfectly safe when there is a

large effusion, but otherwise renders one liable to perforation of the liver and diaphragm. If a sharp-pointed needle is employed suction may be begun as soon as the point of the needle is engaged in the tissues, and the needle then pushed cautiously forward until fluid begins to run.

A disadvantage of the needle is that its point may scratch the surface of the heart as it moves with systole and diastole. The trocar and cannula is not open to this objection, and is, on the whole, preferable. Moreover, a cannula can be moved about in order to loosen any adhesions. If there is strong reason to feel that fluid has collected, more than one effort to find it should be made.

While it is important to avoid puncture of the heart itself, this has occurred repeatedly without special damage, and in only one recorded case has such an accident proved fatal. Sloan saved a moribund patient suffering from pericarditis by unexpectedly drawing ten ounces of blood from the right ventricle.

Etiology.—Pericarditis is never an idiopathic affection. It may be due to infectious germs, or to toxic conditions of the blood, or to inflammation extending from contiguous organs. It is very frequently associated with acute articular rheumatism, and it may precede the joint symptoms, especially in children. It may also complicate scarlet fever, measles, small-pox, and typhoid fever.

Literature of '96-'97-'98.

Statistics of 100 cases of pericarditis. Of these, 50 were dry, 41 serous, 4 hæmorrhagic, and 5 purulent. Seventy-four were males and twenty-six females. The majority of cases occurred in January. Acute rheumatism was cause in 51 cases; pneumonia in 18; chronic nephritis in 7; pleurisy in 5; chronic rheumatism in 2; gonorrhœa in 2; and various causes in the others, 9 cases being classed as

idiopathic. G. G. Sears (Boston Med. and Surg. Jour., Apr. 22, '97).

Rheumatic pericarditis is, in the adult, more rare than endocarditis, but in children rheumatic pericarditis is the more common lesion of the two. Plieque (*La Presse Méd.*, June 4, '98).

Among 45,000 cases of diseases in children 66 instances of pericarditis—20 during the first year of life—observed. In 24 cases the cause of the disease was rheumatic polyarthritis, with or without chorea. Next in frequency were tuberculosis and pleuro-pneumonia. The forms of pericarditis in childhood correspond anatomically to those seen in the adult, though there is a marked tendency in early life to the formation of purulent exudates and to circumscribed or extensive adhesion of the pericardial layers. Serous pericarditis was seen 13 times. In young children the pericardial sac had the shape of a cone with convex walls; as the child grows older, the sac assumes more and more the form of an ovoid pointed toward the apex of the heart. In pericarditis of young children an area of dullness was generally found in the posterior wall of the thorax. This dullness might lead to the diagnosis of pleural effusion, but the fact that respiratory sounds become distinct during deep exploratory puncture serve to decide. Friction-sounds are usually audible, but are finer than in the pericarditis of adults. A. Baginsky (*Berl. klin. Woch.*, Nov. 28, '98).

It sometimes occurs in diphtheria, and not so very seldom in association with pneumonia. Septic processes may give rise to it, such as acute osteomyelitis, puerperal fever, and gonorrhœal infection. It has been known to occur after tonsillitis. Tuberculosis is a very important cause.

Its occasional development in cases of chorea brings to mind the mysterious association between rheumatism, chorea, and endocardial disease. Another important cause is chronic nephritis. Gout, scurvy, purpura hæmorrhagica, leukæmia, and cancer also deserve mention.

The disease attacks youth and middle life oftener than old age. Addiction to liquor increases the liability to pericarditis. Males are somewhat oftener attacked than females.

By extension from contiguous organs the disease is developed in pleurisy and pleuro-pneumonia, endocarditis, purulent myocarditis, aneurism of the aorta, and also from disease in the bronchial glands, the bones, the œsophagus, and even the abdominal viscera. (Osler.)

Pathology.—The changes in the pericardium due to inflammation correspond closely to those seen in other serous membranes, particularly the pleura. The first change is an injection of the superficial blood-vessels, which may give the whole surface a dull-red color. Fibrinous exudation may consist either of a few stringy deposits, or a more uniform thin membrane, or, again, a thick, irregular coating. This coating may be ridgy, honey-combed, or shaggy. In chronic cases it may become of enormous thickness, and even present plates of cretaceous material.

In cases of sero-fibrinous exudation the amount of fluid varies between two or three hundred cubic centimetres and two litres. There is a record of the enormous quantity of one gallon. The fluid may be tinged with blood, especially in tuberculosis, cancer, and nephritis. Aged patients are apt to have hæmorrhagic fluid. Purulent exudations consist of a creamy or a thinner sero-pus; in some cases they are offensive: "ichorous."

In cases of rather long duration or great severity the myocardium is involved in the process to the depth of two or three millimetres, entailing an organic weakness which gravely affects the prognosis.

In case the patient survives the disease, permanent changes in the membrane remain behind. There may be

small patches of cicatricial change, or a limited number of adhesions, or, again, the pericardial sac may be entirely obliterated, presenting the condition of chronic adhesive pericarditis.

The changes thus far enumerated relate to the inner surface of the pericardium; not infrequently the inflammatory process involves its outer surface as well, giving rise to pleuro-pericarditis and mediastinitis, and eventually binding the heart in an unnatural degree to surrounding parts. (See below: CHRONIC ADHESIVE PERICARDITIS.)

Prognosis.—Acute fibrinous pericarditis is seldom fatal, and most cases of rheumatic origin recover. On the other hand, the disease is very often a terminal phenomenon in patients very ill with certain diseases, such as nephritis, pleuro-pneumonia, and sepsis.

Literature of '96-'97-'98.

Out of 100 cases of pericarditis, 43 cases died and 4 were discharged unrelieved. The etiology seemed to have much influence upon the prognosis, as only 5 of the cases occurring in the course of acute rheumatism were fatal. G. G. Sears (Boston Med. and Surg. Bull., Apr. 22, '97).

Tuberculous pericarditis is almost invariably fatal. The rapid outpouring of a large amount of fluid is dangerous from its mechanical effect, and aspiration may then save life if promptly performed. Cases seemingly desperate may recover, even without intervention.

Literature of '96-'97-'98-'99.

From 100 cases of paracentesis pericardii collected, 38.4 per cent. made complete recovery, the rest dying anywhere from a few minutes to six months or more after the operation. J. H. Burtenshaw (Med. News, Mar. 11, '99).

Treatment.—Pericarditis is not at all a disease in which routine measures are

demanded or justified. Some cases, both of the fibrinous and sero-fibrinous variety, may progress to recovery unaided. If there is præcordial or troublesome palpitation, dry cold may be employed over the heart; it should be used at first tentatively. We may employ an ice-bag covered with flannel or Leiter's coil.

Pain may demand an opiate. A fair amount of sleep for the patient is imperative. For this purpose bromide of sodium is useful and paraldehyde seems especially suitable, because it is somewhat stimulating. Robust patients in an abrupt and stormy onset of the disease may be benefited by leeches applied over the heart; but venesection and such cardiac sedatives as aconite are to be avoided.

Some patients obtain more relief from hot than from cold applications. Blisters are to-day little used, although some authorities believe that they hasten the absorption of effusion. Cantharides is contra-indicated in nephritic cases. No internal remedies seem to have any specific effect either in preventing or curing the inflammation.

If, as is likely to happen in the progress of the disease, the pulse becomes irregular, intermittent, and of low tension, resort must be had to digitalis.

The bowels should be kept open by salines, and acetate of potash may be employed as a diuretic. Moderate amounts of easily-digested nourishment should be given at brief intervals.

Literature of '96-'97-'98.

One must be guided by the etiological factor. The application of ice, with such quietude of body as can be secured, and the control of the heart by small doses of strophanthus and digitalis is advised. If exploration of the pericardial sac is necessary, the use of careful incision recommended rather than of puncture.

The treatment of pericarditis in children should be directed against the

causal and accompanying disease. The excited heart's action is controlled by rest in bed, by strophanthus or digitalis, and by the application of ice locally. Ichthyol ointment (from 20 to 30 per cent.) is useful, and in some cases the old calomel treatment and mercurial ointment may be of value. Surgical treatment may be indicated; in that case incision to mere puncture is preferred. A. Baginsky (Berl. klin. Woch., Nov. 28, '98).

In rheumatic pericarditis the treatment is first prophylactic. While the salicylates do much toward relieving the articular pain, they are of little value in preventing cardiac complications, except in that they shorten the duration of the disease. Small doses of sulphate of quinine may also be valuable as a supportant and prophylactic treatment. After the pericarditis has once been established the chief part of the treatment should consist in local counter-irritation. Plicque (La Presse Méd., June 4, '98).

It has been stated that rheumatic cases almost always recover; this is true even when large effusions are developed, so that some delay in paracentesis is justifiable here; but in general it is better to be prompt in the removal of any large effusion. One purpose of this is to relieve the heart of mechanical embarrassment, and another is to discover the character of the effusion, for purulent pericarditis has a better chance of recovery if permanent drainage is early established. For other particulars with regard to aspiration see DIAGNOSIS.

Several surgeons have made independent studies of the best method for draining the pericardial sac. In a general way it may be said that an important point is to avoid opening the pleural cavity, which might cause pneumothorax or empyema.

The fourth (Porter), fourth and fifth (Roberts), or fifth and sixth (Delorme) costal cartilages near the sternum may be resected, the pleura and the internal

mammary artery being drawn toward the left, and the pericardium thus exposed.

Importance of suturing the pericardium to the lips of the wound after incision insisted upon. Eiselsberg (Wiener klin. Woch., Jan., '95).

Literature of '96-'97-'98.

It is clearly the duty of the surgeon, whenever death is imminent from cardiac pressure, to resort to tapping. The operation is not attended with great danger, and in cases of effusion from rheumatic pericarditis there is every prospect of recovery. A. Meldon (Brit. Med. Jour., Dec. 12, '96).

In pericarditis morphine should be used freely if there is much pain. Alcohol and digitalis should be given when the circulation is feeble. In seven cases, the pericardium tapped six times with success. If the diagnosis is clear and if the breathing and circulation are dangerously impeded, tapping is indicated. Greatest success obtained by tapping just inside the left limit of the dullness. F. Shattuck (Boston Med. and Surg. Jour., July 8, '97).

Further evidence adduced in favor of personal contention that pericardial effusions should be treated in the same manner as pleural effusions, paracentesis being insufficient to cure suppurative pericarditis. Incision and drainage are essential, and should be executed as soon as the diagnosis of pus in the pericardium is made. The diagnosis of the purulent character of the effusion is determinable only by exploratory puncture. This should be done at the upper part of the left xiphoid fossa, close to the top of the angle between the seventh cartilage and the xiphoid cartilage. Pericardiotomy should then be done after resection of the fourth and fifth costal cartilages, raising a trap-door of these cartilages and using the tissues of the third interspace as a hinge. The mammary vessels and pleura are thus exposed and pushed to the left. The prognosis is good after pericardiotomy for pyopericardium. List of 26 collected cases showing 10 recoveries and 16 deaths. Of the fatal cases, 9 were septic, and all the others which died had com-

plicating lesions,—pulmonary, cardiac, or renal. J. B. Roberts (Med. News, May 8, '97).

Study of the anatomy of the parts upon 100 cadavers, showing that beneath the sternum there is always an area of cellular tissue with definite boundaries. There is an expansion of this cellular space at its superior and inferior portions which are connected by a more or less constricted link. The inferior portion lies beneath the costo-sternal junction of the sixth and seventh ribs, and a portion of the sternum adjacent thereto. The lower boundary corresponds to the base of the pericardium. By removing this portion of the sternum and sections of the sixth and seventh ribs at their costo-sternal junction the safest and surest approach to the pericardium is obtained. At this point there is no danger of injuring the diaphragm or pleura, and the internal mammary, lying to the outer side, can be avoided. The guide to the incision should be the tubercle of the left sixth sterno-costal articulation. The incision should be parallel to the axis of sternum, about six or eight centimetres long, and should traverse the tubercle of the sixth rib at its junction with the sternum. Voinitch-Sianojensky (Revue de Chir., Nov. 10, '98).

Chronic Adhesive Pericarditis (External Pericarditis; Pleuro-pericarditis; Mediastino-pericarditis).

The obliteration of the pericardial sac may not embarrass the heart's action in any important degree. If, however, the adhesions are formed at a time when the heart is dilated, the heart cannot easily regain its normal size, and is apt to become incompetent. If the external surface of the pericardium, as well as the internal, forms unnatural adhesions, the condition is far more serious.

Diagnosis.—In many instances internal adhesions are not capable of demonstration, although they may be suspected if there is rapid heart-failure after an attack of pericarditis. External adhesions may cause abnormal motions of the

thoracic walls. Systolic retraction of the thorax in the neighborhood of the apex-beat is particularly characteristic; there may also be an epigastric retraction, and one at the seventh and eighth ribs near the left edge of the sternum. It has also been stated that laterally and posteriorly there may be a similar systolic depression at the base of the left chest. In some cases the *pulsus paradoxus* is produced, namely: the radial pulse becomes feebler or intermits with every inspiration.

The veins in the neck sometimes exhibit a diastolic collapse, being at other times overfull. Much value is placed upon the diastolic shock, or rebound, which may be felt on placing the hand over the heart's apex.

Other points are the wide extent of the cardiac dullness and of visible cardiac motion, and the fixity of the apex-beat without regard to alteration of posture or respiratory influences.

The discovery of this condition is valuable only as a means of prognosis, the treatment being *nil*. The embarrassed heart may be stopped in a sudden fatal syncope, or go through the more gradual changes of ruptured compensation. Sometimes chronic mediastinitis extends through the diaphragm, in children, and gives rise to perihepatitis, perisplenitis, and chronic ascites.

Physical sign of adherent pericardium observed in four cases. In three cases there was abundant evidence of adhesion of the pericardium to the chest-wall as well as to the diaphragm, but in one the heart moved freely under the ribs and the lung expanded well over it. The sign consisted in a visible retraction, synchronous with the cardiac systole, of the left side of the back in the region of the eleventh and twelfth ribs. In three of the cases there was also systolic retraction of less degree in the same region on the right side. In all the cases there was a definite history of pericardi-

tis. The only means of causing this retraction on both sides would seem to be the diaphragm, which, if pulled upon, would have more effect on the floating eleventh and twelfth ribs than on the other, more fixed, ones. Walter Broadbent (*Lancet*, July 27, '95).

Literature of '96-'97-'98.

Pericarditis in youth, before puberty, is often adhesive, and at no distant time proves fatal in association with great enlargement of the heart. Occurring later in life, adhesive pericarditis is unimportant. In children it is generally of rheumatic origin. Dickenson (*Amer. Jour. Med. Sci.*, Dec., '96).

From study of a case of obliterative pericarditis causing hepatic enlargement and ascites, following conclusions are offered: 1. Some cases of hepatic enlargement with ascites, and other evidence of portal stasis, appear to be due to chronic obliterative pericarditis. 2. Appreciation of this possibility may lead to the correct diagnosis through careful and frequent examinations of the heart and close scouting of the previous history. 3. The disease appears to be relatively frequent in persons under 30 years of age, and usually runs a course of from 6 to 12 years; that is, a longer course than most cases of primary alcoholic cirrhosis. The fact is of importance in prognosis. 4. Treatment is in any case simply palliative. R. C. Cabot (*Boston Med. and Surg. Jour.*, May 19, '98).

Hydropericardium.—In dropsy of the pericardial sac it is usual to find post-mortem a teaspoonful or two of serous fluid in the pericardium which probably transudes after death. Larger quantities may form during life as a result of chronic heart disease, emphysema, and more often chronic nephritis. In these cases there is no friction-sound nor other evidence of inflammatory change. The symptoms are usually merely those of the causative condition, although, of course, a large amount of fluid may add to the embarrassment of the heart.

The prognosis and treatment are directed to the underlying disease, and it is rarely necessary to aspirate.

Hæmopericardium.—Blood in the pericardial sac is a rare condition which may be caused by aneurism of the aorta, aneurism of the coronary arteries, and by trauma. Death is usually too prompt for any treatment, and diagnosis is rarely possible. In a few traumatic cases aspiration has been successfully carried out.

Pneumopericardium.—Air in the pericardial sac may be caused by perforating glands, and by the perforation of some lesion in the lungs, œsophagus, or stomach.

There is almost always a purulent exudation in addition to the gas present; rarely there may be merely a sero-fibrinous fluid.

The auscultatory signs of such a condition are striking; the sounds take on a metallic character, and there may be a splashing audible even at a distance. The areas of tympany and of dullness, respectively, will be changed by altering the patient's posture. Treatment is the same as for a severe attack of ordinary pericarditis. The prognosis is extremely grave.

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PERITONEUM, DISEASES OF THE.

Acute General Peritonitis.

Symptoms.—Acute general peritonitis is usually of sudden onset and is ushered in by rigor, chill, and high fever. There is intense pain in the abdomen, which is sometimes localized, but usually soon becomes general. The pain, when localized, is often in the region of the disorder acting as primary cause. When due to a ruptured gall-bladder, it is located in the right hypochondrium; when a ruptured gastric ulcer

is the cause, it occupies the region of the left hypochondrium or the back between the shoulder-blades. A ruptured appendix vermiformis or a peritonitis caused by disease of the appendix causes intense pain, which, when localized, is in the right iliac fossa. The pain, however, is frequently at the umbilicus and not seldom in the left iliac region. (See APPENDICITIS.)

The pain of an acute general peritonitis, if at first localized, soon becomes general. It is aggravated by movements and by pressure. The patient lies on the back or the side with the legs drawn up. The face is blanched and haggard and the expression anxious. These are the symptoms at the beginning, during, and shortly after, the chill. The temperature at this time may not be much elevated. Occasionally, if the shock is very great, it may even be subnormal. The pulse is thready and rapid. Vomiting is an early and very painful symptom.

Soon, however, the symptoms of acute septic poisoning begin, and we have an entirely different clinical picture. The face, while still drawn and pinched, is less pale; the expression is of great suffering and absolute helplessness; the pulse is fuller, though weak and more rapid, 120 to 140; the temperature is high, 102 to 104 or over; the skin is dry; the abdomen is distended and tympanitic. The area of liver-dullness is generally obliterated in the mammary and middle lines, and there is intestinal paresis. The urine is scanty and the bowels constipated; the skin may be dry or bathed in sweat. An effusion of fluid is usually present at some stage of the disease and can be demonstrated in the flanks, which are dull on percussion. The patient presents all the symptoms of septicæmia, and is gradually overwhelmed by the toxins of the organisms

which are the cause of the inflammatory process.

Diagnosis. — The diagnosis of acute general peritonitis is not always clear at first, but, as a rule, it is made from the history and the sudden onset of the symptoms. The primary source of the infection determines the treatment, and must be diligently searched for. This disease simulates several other conditions. The more common of these conditions are: enterocolitis, obstruction of the bowel, hysterical peritonitis, rheumatism of the abdominal walls, local circumscribed peritonitis, and tubercular peritonitis. In enterocolitis the pain is less severe and more spasmodic in character, the distension of the abdominal walls is not so great as in acute peritonitis, and the dyspnœa is less severe. In enterocolitis there is usually diarrhœa, whereas constipation is common in peritonitis.

Acute peritonitis is to be distinguished from **INTESTINAL OBSTRUCTION** by the absence of stercoraceous vomiting and tumefaction above the seat of obstruction.

Literature of '96-'97-'98.

The differential diagnosis between acute septic peritonitis and acute mechanical obstruction is always difficult, and oftentimes impossible, without an operation. But perhaps the following slight differences may help in making the diagnosis: 1. The intestinal obstruction is more often absolute in mechanical obstruction. 2. The vermicular movements persist for some time, and may be increased in mechanical obstruction. 3. The pulse has a good volume, and is not markedly accelerated in mechanical obstruction. 4. Fluid does not collect in the pelvis in mechanical obstruction, and evidences of inflammation of the appendix, Fallopian tubes, gall-bladder, and so forth are wanting. 5. Elevations of temperature are less common in mechanical obstruction. 6. Fæcal

vomiting occurs earlier in acute mechanical obstruction.

Laparotomy may have to be done as a final step in the diagnosis. C. B. Lockwood (Clin. Jour., Apr. 1, '96).

TUMOR is frequently present in cases of acute peritonitis, and the location and character of the tumor determines the diagnosis. Examples of such cases are appendiceal abscesses, ovarian cysts with twisted pedicle or other ovarian tumors undergoing malignant or degenerative changes, extra-uterine pregnancies; biliary, splenic, or perinephritic abscess, etc.

HYSTERICAL PERITONITIS occurs occasionally in patients of nervous temperament, and may so closely simulate acute peritonitis as to make the differential diagnosis difficult. There is, however, complete absence of cause, and no disease of the abdominal viscera can be discovered.

RHEUMATISM OF THE ABDOMINAL WALLS is generally accompanied by symptoms of rheumatism elsewhere.

LOCAL CIRCUMSCRIBED PERITONITIS may give rise to the symptoms of a general peritonitis. The disease becomes localized by reason of a rapid adhesive inflammation's shutting off the general peritoneum. This often follows ulceration of the stomach and other abdominal viscera. The most frequent seat of local or circumscribed peritonitis is in the right iliac fossa, due to perforation of the appendix vermiformis subsequent to catarrhal ulceration of the same. Disease of the Fallopian tubes is frequently the cause of localized peritonitis. A general acute peritonitis may follow any of these forms of localized peritonitis, with abscess-formation, by reason of a gradual extension and burrowing of pus in various directions and so infecting the general peritoneal cavity. (See sec-

ond colored plate in the article on APPENDICITIS, volume i.)

Literature of '96-'97-'98.

Signs of most value in recognizing typhoid perforation are sudden, acute abdominal pain, collapse, and abrupt and decided fall of temperature. Vomiting is often present. The obliteration of liver-dullness, the gurgling sound on respiration, hiccough, etc., are valuable signs when present. As a rule, perforation is quickly followed by symptoms of peritonitis. The streptococcus pyogenes is usually found in numbers in the exudate of perforative peritonitis. J. N. T. Finney (Annals of Surg., Mar., '97).

Of the general peritoneal infections dependent upon appendicitis, those in which the colon bacillus predominates are attended by a comparatively low temperature; those caused by the streptococcus pyogenes by a high one; a mixed infection may show a high or a low temperature, according to the predominance of one or the other of these germs; the progress of a streptococcal infection is rapidly fatal, of a staphylococcal comparatively slow, of a colon bacillus sometimes rapid and fatal and sometimes mild and favorable. As a rule, however, the milder the germ, the milder and more favorable the case.

Personal case in which erysipelas was the cause of infection. M. H. Richardson (Boston Med. and Surg. Jour., Sept. 8, '98).

Etiology and Pathology.—The surface of the peritoneum, we are told, is as large as that of the integument of the body; in its reduplications and folds it partially surrounds all the abdominal organs and viscera. It is, therefore, exposed to infection on all sides. The infection is always one or several forms of micro-organism which gain access to the peritoneal cavity. The pathogenic germs which most commonly give rise to peritonitis are the bacillus coli communis, the staphylococci aureus and albus, bacillus pyocyaneus, the streptococcus pyog-

enes, the gonococcus, and the tubercle bacillus. The infection is not always a pure culture, but is usually mixed; several forms of pathogenic micro-organisms being present.

Literature of '96-'97-'98-'99.

Bacteriological classification of peritonitis: (a) Streptococcic infection. The streptococcus pyogenes is the microbe which is most frequently found in the tissues in cases of septic peritonitis. The infection spreads so rapidly over the peritoneal surface and through the subserous lymphatics that death, as a rule, occurs from septic intoxication before a sufficient length of time has elapsed for any gross pathological lesions to form. Absence of fibrinous exudate and effusion are the most striking negative findings at operations and necropsies.

(b) Staphylococcic infection. In peritonitis caused by staphylococcic infection the intrinsic tendency to localization of the disease is more marked. As a rule, the inflammation terminates in the formation of thick, cream-colored pus.

(c) Pneumococcic infection. The diplococcus occasionally is found as the bacteriological cause of acute suppurative peritonitis.

(d) Bacillus - coli - commune infection. The bacillus coli commune is, in a fair percentage of cases, the bacteriological cause of acute peritonitis. This microbe possesses pyogenic properties, and in intestinal paresis and perforations escapes into the peritoneal cavity, and usually produces a pathologically mixed form of peritonitis; that is, suppurative and fibrinoplastic peritonitis.

(e) Gonococcic infection. In the peritoneal cavity the gonococcus produces a plastic peritonitis, and sometimes localized suppuration. Salpingo-peritonitis and the more diffuse pelvic peritonitis is most frequently caused by gonococcic infection.

(f) Tubercular infection. The rapid diffusion of the tubercle bacillus in the peritoneal cavity occasionally gives rise to a form of acute peritonitis characterized as such in a modified way by the clinical manifestations which accompany

it. According to the intensity of the infection or the degree of susceptibility of the patient to the action of the tubercle bacillus, the disease assumes one of the following pathological forms: (1) tubercular ascites; (2) fibrinoplastic peritonitis; (3) adhesive peritonitis. Suppuration takes place only when the tubercular product becomes the seat of a secondary mixed infection with pus microbes. N. Senn (Med. News, May 8, '97).

Personal cases bring for the first time convincing evidence of the existence of a diffuse, general inflammation of the abdominal cavity caused by the gonococcus. It has been recognized that extension of the gonorrhœal infection from the genital organs to the peritoneum may occur in the puerperal state; a similar sequel is shown to be possible during menstruation. Such ascending forms of gonorrhœa doubtless under ordinary circumstances remain localized in the pelvis, and rarely demand surgical investigation in the acute stage.

A general involvement of the peritoneum must either be rare or unrecognized, and may depend upon some especially-receptive condition of the serosa or virulence of the organism. The peritoneum is not more immune than are the pericardium and endocardium to gonococcic infection, and, being more exposed, suffers more commonly in females, although the relatively benign course of the disease makes it a rare condition to come to the attention of the surgeon in the acute stages. Cushing (Johns Hopkins Hosp. Bull., May, '99).

The most frequent source of infection is from the intestine, caused by the migration of the bacilli coli communis through inflamed intestinal walls or directly through a rupture caused by traumatism or perforating ulcer.

Peritonitis is frequently caused by extension of inflammation from the various abdominal organs and by perforation in some part of the intestinal tract, as in gastric, typhoid, tubercular ulcers or perforative appendicitis, or perforating

diseases of the gall-bladder. It may follow inflammation or disease of the pelvic viscera, as shown in many cases of salpingitis, extra-uterine pregnancy, and septic metritis. The primary inflammation in the various organs or viscera is always caused by a micro-organism, and the peritonitis which follows, to extension of the infection. The bursting of abscesses into the abdominal cavity from the liver, the spleen, or the kidneys is another cause of peritonitis. Gonorrhœa may cause peritonitis by extension of the infection through the uterus and Fallopian tubes.

Literature of '96-'97-'98.

Diseases in which acute general peritonitis may arise are as follow (they do not include the traumatic and gynæcological cases): 1. In the alimentary canal: (*a*) peptic ulcer, gastric and duodenal; (*b*) enteric fever; (*c*) appendicitis. 2. Other hollow viscera, the contents of which may be infected: (*a*) the gall-bladder; (*b*) the pelvis of the kidney; (*c*) the urinary bladder. 3. Rupture of abscesses: (*a*) purulent pleurisy; (*b*) subphrenic abscess; (*c*) hepatic abscess; (*d*) abscess of the pancreas; (*e*) appendicular abscess, and (*f*) other pus collections in regions in relation with the peritoneum. 4. Necrotic processes involving abdominal viscera: (*a*) internal strangulation; (*b*) intussusception; (*c*) volvulus; (*d*) embolism and thrombosis of the mesenteric vessels; (*e*) gangrene of the pancreas or of the spleen; (*f*) displaced kidney or spleen with twisted pedicle; (*g*) acute hæmorrhagic pancreatitis; (*h*) fat-necrosis. J. C. Wilson (Jour. Amer. Med. Assoc., July 9, '98).

Traumatic peritonitis occurs as the result of cold or injury by wounds or blows and occasionally as the result of caustic poisons.

The intestines are distended, congested, and more or less matted together, while the peritoneum is opaque

and lustreless. As in inflammation of other serous membranes, so in inflammation of the peritoneum may be found the fibrinous, sero-fibrinous, purulent, putrid, and hæmorrhagic forms of exudation.

Treatment.—The treatment of acute peritonitis is both medical and surgical. The old form of medical treatment by opium narcosis, small doses of calomel, and applications to the abdomen has been abandoned. Our present knowledge of the etiology and pathology does not admit of it. In fact, opium should seldom be used in peritonitis except occasionally for the relief of great pain and in some cases of peritonitis due to sudden rupture of gastric or intestinal ulcer when the object is to put the stomach and intestines at rest and so prevent peristaltic action and the further leakage of intestinal contents into the general peritoneal cavity. Operation should follow as soon afterward as possible. The later form of medical treatment in peritonitis not due to perforation is by saline catharsis and the application of cold to the abdomen. The saline is given in concentrated solution in doses of 1 to 2 drachms every two or three hours until several copious discharges occur daily.

The purgative treatment of peritonitis or threatening peritonitis, or of anything which seems to be likely to turn out peritonitis, if it be promptly brought to bear on the case, will gain the all-important time, and often it gains such time as will call into action that influence which will eventually turn the scale in the favor of the patient. Lawson Tait (Provincial Med. Jour., Dec. 1, '92).

Literature of '96-'97-'98.

In cases of threatening acute septic peritonitis administration of saline cathartics (magnesium sulphate, 30 to 60 grains) advised. Opium ought not to be given in these cases. Opium should be administered in all cases of peritonitis

which are due to perforation. Stimulants should be freely given by the mouth or the rectum, and, if they are not readily retained, they should be administered by injection. Early operation advocated in all cases of acute septic peritonitis. Semm (Brit. Med. Jour., Sept. 4, '97).

In connection with this treatment, the employment of decinormal salt solutions by intravenous injections or by hypodermoclysis has been highly recommended and undoubtedly gives most excellent results. This latter measure is particularly useful in puerperal peritonitis, when it should be used in conjunction with frequent intra-uterine irrigations. Vomiting can usually be controlled by ice and small quantities of soda-water or iced champagne; if, however, it persists, all nutriment should be given by means of rectal enemata. In distressing tympanites the long rectal tube and injections containing turpentine may prove of value.

Antistreptococcic serum has been tried with apparently good results, but the evidence so far adduced is not sufficient to warrant any conclusion as to its merits.

Literature of '96-'97-'98.

Intravenous injection of serum employed in twenty-five to thirty cases of septic peritonitis, very good results being obtained even though the symptoms were advanced and severe. Serum used was that advised by Hayem, and, when this could not be procured, boiled water containing 105 to 150 grains of sea-salt to the quart was employed. The quantity of serum used was usually about 32 to 48 ounces, but in 2 cases 80 and 96 ounces. With this treatment, hypodermic injections of ether, caffeine, and alcohol were combined. Michoux (Gaz. Heb. de Méd. et de Chir., No. 5, '96).

Case of general suppurative peritonitis in which, after multiple incisions and drainage by multiple packings of gauze and by a large drainage-tube passed into

the vagina, the infection yielded only after injections of the antistreptococcic serum.

Antistreptococcic serum appeared to act as follows: Temperature and pulse-rate were uniformly lowered after each administration; elimination of waste, infectious products was favored; pus-production was checked. Grandin (Med. Rec., Apr. 3, '97).

The surgical treatment of acute general peritonitis carried out with proper technique and thoroughness has given the most brilliant results. The incision will depend upon the location of the cause of the peritonitis. Where the cause cannot be determined, the incision should be in the middle line. In other cases the position of the incision depends upon the location of the cause. The incision should always be large enough to admit the hand of the operator and, if necessary, for purposes of drainage, several incisions may be made. Vaginal incision is nearly always necessary in these cases when the cause of the peritonitis is due to disease of the uterus, tubes, or ovaries. The incision having been made and the exciting cause found, it should be removed if practicable. The vermiform appendix should always be removed in appendiceal cases when it is possible to do so. The pus or serous fluid should be allowed to escape, and the intestines be delivered and supported in clean towels rung out of sterile hot salt solution. They should be *gently* examined coil by coil and thoroughly cleansed by irrigation or sponging with hot salt solution. If the intestines are much distended and filled with fluid faeces, they should be incised in some convenient place and the gas and faeces allowed to escape, after which the incisions must be closed with Lembert sutures. Every part of the abdominal cavity must then be thoroughly cleansed

by irrigation or mopping. The intestines are then returned and drainage established by gauze, the ends of the drains being so placed above, below, and between the coils of intestines as to drain every portion of the peritoneum. The incision or incisions are then approximated by silk-worm-gut sutures, taking care not to close tightly in the position of the drains. Many operators advise leaving as large a quantity of salt solution in the abdomen as possible before closing the wound. It seems to prevent or minimize shock and to promote absorption. It also seems to act as a circulatory stimulant. It is often advisable, in these cases, before the patient comes out of ether, to give high rectal enemas of hot salt solution. The quantity should be about 1 quart and the temperature from 105° F. to 110° F. During the first twenty-four hours the patient should be freely stimulated with whisky, and strychnine employed hypodermically. Rectal alimentation may begin early and be gradually replaced by mouth-feeding as soon as the condition of the wound warrants it. As soon as the stomach will permit of it, calomel should be given in divided doses, followed by small doses of salts and enemas until the bowels are freely opened and all distension disappears.

One hundred and nineteen cases of laparotomy in general peritonitis collected, the origin of which was determined in all but 18, of which 9 were successfully treated by laparotomy and 9 died. The majority of the remaining 101 cases belonged to the category of perforation-peritonitis. Of these, 36 were cases of general peritonitis following perforation of the vermiform appendix; 12 were cases of typhoid perforation, and these yielded 5 successes; 12 were due to perforation from gangrene and other causes implicating the bowels; of the gangrenous not 1 recovered, and of the 8 others only three were cured by

the operation. Of traumatic cases, 3 of punctured wounds and 1 of gunshot wound recovered; but, of contusions, only 3 out of 8 cases recovered from laparotomy. The measure, however, saved 5 out of 13 cases of puerperal peritonitis. Lastly, a group of cases of peritonitis from various other causes gave 3 deaths and 6 recoveries. Total result is 119 cases of general peritonitis treated by laparotomy: 51 recoveries and 68 deaths. Krecke (*Münch. med. Woch.*, Nos. 33 and 34, '91).

Operation personally performed on nineteen cases of purulent peritonitis, ranging in age from 2½ to 71 years. Six of these cases are still alive. One of them has a small intestinal fistula. Favorable age for operation is between 18 and 31. Körte (*Centralb. f. Chir.*, Aug. 13, '92).

Literature of '96-'97-'98-'99.

In septic peritonitis the incision should be made in the middle line, or elsewhere, if perforation is suspected, but in every case it should be large enough to allow the ready insertion of the surgeon's hand into the peritoneal cavity. All exudation should be removed from the peritoneum by sponging, irrigation with hot (110° F.) sterile solutions, or by turning the patient into the prone or semiprone position and allowing it to drain out. When the intestines are distended, it is often advisable to make small incisions into them, or to puncture with a needle. Incisions are afterward sewn up. Free drainage should be established. Usually capillary drainage is the more satisfactory. Plain sterilized gauze should be covered with one or two layers of iodoform gauze, so as to avoid the occurrence of iodoform poisoning. Drainage should be dispensed with as soon as possible, and should be left off gradually. Before closing the external wound it may be advisable to inject a strong solution of a saline cathartic into the lumen of the intestine through the walls. Senn (*Brit. Med. Jour.*, Sept. 4, '97).

In operation of acute general peritonitis, when only the lower segment has as yet been invaded, the presenting bowels are mopped with sponges in clamps.

dripping wet with hot salt solution ($1\frac{1}{2}$ drachms to a quart), and dried again before other coils are drawn into the field of inspection. As soon as parts are found not much inflamed, a sterilized-gauze tamponade, properly folded, is pushed among the bowels far away from the field of work. This has a tape sewed to it, to which a clamp is fixed and left outside the wound. One or two such tamponades may be thrust upward and across the abdomen before the pelvis is cleansed. This being thoroughly mopped out, a light packing of mild iodoform gauze is to be placed in the pelvis, and a short way among intestinal coils elsewhere. The abdominal wound should never be closed in any septic case. In the grave cases, a long, median incision, or two lateral ones, will always be needed. The lumbar-drainage incision will not be necessary when the median cut is used. Drainage with ample gauze packing is to be used. When infection has been wide-spread, irrigation should be used, the interintestinal spaces being flushed systematically with hot salt water, as hot as the operator's hand can bear (which will be over 105° , usually). If the intestines are distended with gas and fluid feces, it is well to let them come out of the abdomen, receive them in hot towels in charge of an assistant, and prick one or two prominent places with a knife to evacuate gas and excreta, which is washed away with a constant hot stream. Through one opening there should then be injected a syringe of saturated solution of Epsom salts and the puncture closed. In regurgitation, lavage of the stomach should be done before and after operation, and repeated as soon as regurgitation is renewed. Rectal tube to relieve distension by gas is of inestimable value. An ice-coil, or light, broad ice-bags after a general peritonitis retards the inflammatory action and bacterial growth either before or after operation. Strychnine, $\frac{1}{40}$ grain every 2 hours, is sometimes necessary, and in cases of severe pain when the patient is well out of ether, morphine, hypodermically. Abbe (Med. News, May 29, '97).

In order to establish free drainage of the intestinal canal in grave forms of peritonitis complicated with paralysis it might be advisable to make one or more openings in the distended intestine, care being taken by packing that the discharges from these openings be prevented from coming into contact with the peritoneum or the external wound. Three cases of acute septic peritonitis, in which this treatment was followed by good results. In two of these, inflammatory mischief had been set up by appendicitis. If in any case of acute peritonitis treated by laparotomy the distension and paralysis of the bowel be not complete, it might be found beneficial to leave some distended intestine in the external abdominal wound, and to suture it there, so that at any subsequent time if the bowels be not moved, or if the symptoms of septic absorption continue, artificial openings may be made. Van Arsdale (Annals of Surg., Jan., '99).

An important feature of all operative measures instituted is that all manipulations of the intestine should be attended with the greatest possible gentleness, in order to avoid local complications leading to intestinal obstruction (*q. v.*). This should not, however, prevent the thorough removal of all exudates: a feature of the operation upon which its success depends.

Literature of '96-'97-'98.

In post-operative peritonitis with the first evidences of peritonitis, if there are no evidences of speedy abatement under ordinary measures, the abdominal wound should be opened throughout its entire length and permitted to remain so. Strips of sterilized gauze are then inserted, and enough placed over the wound to entirely cover it. This method has been attended with marked success, not only following celiotomies, but in puerperal cases. H. von Erlach (Wiener klin. Woch., Jan. 20, '98).

Peritonitis in Infants.

Symptoms.—The symptoms of acute peritonitis in the newly born are often obscure and may not be recognized dur-

ing life. The onset is sudden, with vomiting and high temperature: 103° to 105° . The abdomen, at first normal, soon becomes swollen and tympanitic. Upon the occurrence of this symptom the diagnosis is established. The pulse is small and rapid, respirations hurried, and there is great prostration. There may or may not be diarrhoea. Retention of urine is common, yet there may be frequent micturition. The infant is rapidly overwhelmed by the toxins of streptococcic infection.

Etiology.—According to Holt, peritonitis is quite frequent in the newly born. It is a streptococcic infection, occurring as the result of sepsis in the mother, and is often the cause of death. The avenue of infection to the infant is the umbilical cord. The disease may be either local or general. When local it is usually in the neighborhood of the umbilicus or the liver. As in the adult, it results in adhesions or else in peritoneal abscess-formations. Should the infant survive, the resulting adhesions may cause an arrest or an alteration in the development of some part of the intestinal tract. Peritonitis is not uncommon in foetal life. It is probably the cause of those cases of congenital malformations and atresias of the intestines which are sometimes met with. Cases of imperforate anus and stricture in various parts of the intestinal tract are accounted for in this manner.

The records of the Moscow Lying-in Asylum show that in 75,000 autopsies on infants there were 36 cases of congenital atresia of the digestive tract: 21 in boys and 15 in girls. In 11 the occlusion was situated in the ileum, in 8 in the rectum, in 7 in the duodenum, in 5 in the jejunum, in 3 in the œsophagus, and in 2 in the colon. In most of the cases there had been a distinct history of peritonitis during intra-uterine life. From these *data* it was concluded

that peritonitis was the most frequent cause of the atresias of the alimentary canal in the newborn. Miller (Brit. Med. Jour., Sept. 22, '94).

Among the causes are intestinal obstruction from volvulus, intussusception, strangulation from any cause, and congenital atresia. Appendicitis is a frequent cause in young children. Occasionally it is seen in connection with pneumonia and scarlet fever. It may be caused by extension of inflammation and burrowing of pus through the diaphragm from an empyema. These cases are to be treated according to indications.

Peritonitis is rare during infancy and early childhood until the fifth year. In the newly born it occurs in either the acute or chronic form. When acute it is usually a general infection of the peritoneum with the production of serum, lymph, and pus. When it assumes the chronic form, the process is a localized one with abscess-formation. The acute form is almost invariably fatal, death occurring on the second or third day.

Treatment.—The treatment is most unsatisfactory, since the cases usually terminate fatally. It is well to begin with a laxative, either a saline or castor-oil, and to follow this up with drop doses of paregoric. Cold applications to the abdomen, either by ice-bag or coil, have been advised, though most children bear it badly. In these cases hot applications must be substituted. The infant should be freely stimulated with brandy in small and frequently-repeated doses. Feeding by the mouth is most difficult to accomplish by reason of the vomiting. It may be attempted by small doses of some of the prepared foods. Panopepton (Fairchild) in 10- or 15-drop doses every hour will often be well borne. Surgical interference in cases of acute general peritonitis of the newly born due to streptococcic infection is of no avail. In local

peritonitis with abscess-formation incision or drainage is always indicated.

Chronic Peritonitis.

Symptoms.—Chronic peritonitis may be either local or general. In the local form the symptoms are, as a rule, latent, but colicky pains, which are quite severe, are sometimes present. Palpation and percussion seldom reveal anything definite, although there may be felt, in some cases, an ill-defined mass at the point of greatest pain.

The diffuse form may also progress with no definite symptoms, the patients appearing to be in perfect health even with a comparatively enlarged abdomen. In other cases, however, there are gastrointestinal disturbances, as loss of appetite, constipation, or sometimes diarrhoea, the patients gradually becoming greatly emaciated and anæmic. Slight fever may or may not be present. Examination of the enlarged abdomen will often reveal fluctuation, if the fluid is not capsulated, while in other cases hard, rounded masses caused by the thickened omentum and fibrous bands may be detected by palpation.

Etiology and Pathology.—Several varieties of chronic peritonitis may be recognized, of which the following are the most important (*a*) local adhesive, (*b*) diffuse adhesive, (*c*) proliferative, (*d*) chronic hæmorrhagic, and (*e*) tuberculous, which will be treated separately.

Chronic local adhesive peritonitis is usually the result of an acute localized attack and is situated most commonly in the region of the appendix, spleen, and liver. In such cases adhesions are found, especially between the two latter and the diaphragm. This variety may also affect the intestines and mesentery, causing matting together of the former and the formation of adhesions and fibrous bands.

The chronic diffuse adhesive variety is

usually the result of an acute general peritonitis. The peritoneum is thickened and the layers are indistinguishable, while the intestines are tightly matted together.

Proliferative peritonitis is most often due to chronic alcoholism. It consists principally in the production of connective tissue, which causes a great thickening of the peritoneum. Adhesions are not usually present. The omentum is often rolled up into a hard mass, which lies transversely across the abdominal cavity. This form of peritonitis may develop without fibrin, serum, or pus, or these may be present in small amounts.

According to Cornil and Ranvier, both circumscribed and diffuse hæmorrhagic peritonitis may occur, though seldom, in hypertrophic cirrhosis, articular rheumatism, tuberculosis, and Bright's disease. The inflammation causes the development of successive layers of connective tissue containing large numbers of wide vessels with thin walls, from which hæmorrhages occur. The circumscribed form is the more common.

Treatment.—All food capable of inducing the production of gas should be forbidden and constipation be relieved by enemata or gentle laxatives. Iron, arsenic, quinine, and other tonics, as well as the iodides, may prove of value.

Surgical intervention, however, is of most service, and when ascites is present, if repeated tapplings fail to stop the accumulation of fluid, operative intervention is often indicated.

Tuberculous Peritonitis.

Symptoms.—This disease may, in some cases, be entirely latent, and be only recognized by the surgeon during an operation for some other condition.

In other cases, however, it is ushered in by fever; rapid, small pulse; more or less acute pain in the abdomen; and con-

tinuous diarrhœa, or diarrhœa alternating with constipation. Rapid loss of flesh and strength follows, and ascites is frequently present.

When the acute stage is absent the onset may be slow, with low fever, tympanites and tenderness of the abdomen gradually developing. Pigment of the skin is often present.

Ascites is a very frequent symptom of tuberculous peritonitis and, according to Senn, the amount of fluid may vary from a teacupful in the circumscribed to four or six gallons in the diffuse form. Distinct fluctuation is obtained in the latter variety, while the former may simulate small cystic tumors.

In the cases without effusion the adhesions are apt to result in various gastro-intestinal disturbances, even causing intestinal obstruction at times. Symptoms may, however, be entirely latent.

Diagnosis.—In the acute cases the symptoms of enteritis or hernia may be closely simulated, while in those of slow onset the differential diagnosis from typhoid fever is not always easy.

When ascites is present it must be separated from the same condition due to hepatic cirrhosis, chronic simple peritonitis, and cancerous peritonitis. The latter usually occurs late in life, and, although the omental tumor, ascites, and abdominal pain may be present in both diseases, there is generally absence of the tubercular history, with the presence of a gradually growing mass, and the peculiar cachectic appearance observed in cancer.

When the effusion is circumscribed the diagnosis must be made between that and ovarian cysts, pregnancy, hydrosalpinx or pyosalpinx, pelvic abscess, hydro-nephrosis or pyonephrosis, pancreatic cyst, or enlarged gall-bladder. In differentiating the tuberculous tumor from

an ovarian cyst, which is the most frequent source of error, the fever, intestinal disturbance, history of the patient, and presence of tuberculous lesions in other parts of the body would point toward the former. In all the pelvic diseases a careful vaginal and rectal examination—under ether, if need be—will soon make clear the diagnosis. The tuberculin test may also be of value.

Etiology.—Most of the cases are due to extension of the disease from some adjacent organ. Out of 2230 post-mortems by König in Göttingen there were 107 cases of tubercular peritonitis. Of these, 89 were males and 18 females. In 99 tuberculosis of the lungs co-existed; 60 had more or less severe pleural complications; 80 had ulceration of the intestines; 44 had affection of the mesenteric glands; 38 had tubercle of the kidneys; 40 had the spleen affected; 4 of the 18 females had tuberculosis of the tubes and ovaries. Osler states that in his own series of 21 cases 15 were males, but that in the collected statistics the cases are found to be twice as numerous in females as in males, owing to the fact that the recent laparotomies performed in this disease have been chiefly in women. It may occur at all ages, but is most common between 20 and 40.

Pathology.—The peritonitis accompanying miliary tuberculosis shows the peritoneum studded with small, gray, translucent tubercles. In the more frequent form of tuberculous peritonitis the peritoneum becomes thickened, the intestines are matted together, and adhesions are formed which often capsulate the exudate, resulting in small tumors. The omentum may be thickened and contracted into a hard mass. When fluid is present it is usually serous or fibrinous, although it may become hæmorrhagic or purulent.

Treatment.—The medical treatment, which is seldom satisfactory, consists in maintaining the general health of the patient by means of rest, good hygienic surroundings, easily digested and nourishing food, and tonics. The symptoms are to be treated as they arise.

Laparotomy seems to offer the best hopes for amelioration and in some cases for cure. An examination of the records of three hundred cases by Treves (*Brit. Med. Jour.*, Oct. 31, '96) shows that excellent results have been obtained in tuberculous peritonitis of almost all grades, and that good prospects of recovery may be expected in over 60 per cent. of instances. The highest percentage of cures has been attained when the abdomen has been neither flushed nor drained, but when the exudation has been merely evacuated and the parietal wound closed. Great care should be taken to avoid injuring the membrane; indeed, it is much better to allow a few ounces of a harmless effusion to remain than to remove it by reckless flushing and sponging.

Others have used sterilized air with considerable success, this treatment being based upon the fact that the introduction of air during laparotomy in such cases was the main factor in the excellent results observed.

Any tuberculous foci, as diseased tubes, also enlarged lymphatic glands, should be removed.

In a considerable number of cases recovery in tubercular peritonitis is possible, either spontaneously or after operative interference. The cases most likely to terminate favorably are those in which the infection is limited to the peritoneum, the inflammation of moderate grade, and the effusion slight in amount and sero-fibrinous. An adhesive inflammation may accompany the process from the outset, and a gradual sclerosis may overtake the tubercles and ren-

der them harmless. Caseation and ulceration, with a sero-purulent exudation, preclude the possibility of spontaneous cure. Extension to the pleura and lungs and the co-existence of intestinal or tubal disease are conditions equally unfavorable to permanent recovery. Cases most suitable for operation are those with fresh eruption and considerable effusion, whether free or sacculated.

When the Fallopian tubes are extensively diseased, and when the process has extended through the diaphragm to the pleura, the condition is less favorable. The existence of marked omental tumor, in the form of a transverse ridge, need not necessarily be an objection to operation, as spontaneous resolution of such masses may take place. In cases, then, with somewhat sudden onset, rapid development of ascites with fever of moderate grade, we may be most sanguine of success. In the class of cases with extensive caseous masses in the peritoneum and a purulent exudation the outlook is necessarily less hopeful; but even in such instances, particularly when the exudation is sacculated, laparotomy may be advised as a palliative measure. In the chronic adhesive form no benefit can be expected to follow the operation, which can only be intended to remove an omental mass or to open a sacculated effusion. Osler (*Johns Hopkins Hosp. Reports*, '90).

One hundred and thirty-one cases of laparotomy for tubercular peritonitis (11 male, 120 female) collected. Personal experience consists in 14 of these, of which 6 were completely cured; most of the patients (70 per cent.) were over 20 years. Laparotomy will cure one-fourth of all cases; 107 were much ameliorated; some have remained well for lengthy periods, viz.: 25, 13, 9, 8, and 7 years. Danger of the operation is not great—only 3-per-cent. mortality—as opposed to the fatal nature of the unattacked disease. Chief elements of success appear to be the employment of not too small an incision, and the thorough evacuation of fluid and removal of tubercular masses and organs. Lavage with strong antiseptic solutions was performed in 80 cases, and without such in

50 cases. More cases healed *without* antiseptic lavage. König (Deut. med. Zeit., Jan. 8, '91).

Two hundred and five cases of peritoneal tuberculosis which were operated upon collected. Of the 205 cases, 15 (or 7.5 per cent.) died; only a few of these from peritonitis or sepsis, the most from collapse after long operations. Among 186 patients, of whom the sex was given, 11.3 per cent. were men. In women the genital organs were most commonly the avenues of infection. The number of fatal cases among men was greater than among women. The best prognosis is to be given in capsulated cases and in those with much exudate. The most important factor in resorption is that the serosa should be intact. Lindner (Deut. Zeit. f. Chir., B. 24, p. 448, '92).

Of 118 cases of tuberculous peritonitis of children treated by laparotomy, personally collected, 82 were successful, 36 fatal, either by generalization of the disease or as a result of the operation. Phocas (La Méd. Mod., Dec. 3, '92).

Only the ulcerous form of tubercular peritonitis is incapable of spontaneous recovery. Of 308 cases of all forms treated by operation, 140 were of the ascitic type, and of these 101 were cured, 3 died, 2 were improved, 6 not improved; of 26 cases of the fibrous type, 21 were cured and 5 died; of 22 cases of the ulcerous type, 13 recovered and 9 died; of 41 cases of tuberculous peritonitis secondary to tuberculosis of the pelvic organs, 27 were cured and 14 died. The number of deaths includes those due to operation and those due to the disease. The mortality of operation is put down as $2\frac{1}{2}$ per cent.; 33.4 per cent. of the "cured" cases are stated to have been complete recoveries.

In regard to the indications for operation in the ascitic type, the very acute cases, or those forming part of acute general miliary tuberculosis, are not to be operated upon. The other varieties, whether the dropsy is encysted or not, are amenable to laparotomy. Irrigation, medication of the peritoneum, and drainage have shown no better results than simple incision; further, sinuses have

sometimes followed the use of drainage. Relapse occasionally occurs.

The fibrous form least often calls for interference, as it is the form which recovers spontaneously or by medical measures. If, however, the general condition of the patient is deteriorating, operation may be required. Incision and irrigation have given the best results. The ulcerous form, where there is little or no fluid or the fluid is encysted in many small loculi, is almost beyond the reach of operation; where, however, the fluid is not confined to one or to several large pockets, incision and drainage are of benefit. Treves (Annals of Surg., May, '94).

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It is the imperative duty of the surgeon to freely evacuate by incision all fluid of a tubercular peritonitis. In all probability additional perfection will be obtained by irrigation with normal salt solution. Where advanced tubercular deposits can be sponged over with camphor-naphthol, it is probable some additional good will accrue. The purulent form of peritonitis is amenable to the same treatment. Cure has frequently followed a second laparotomy when the ascites has reaccumulated, which is the exception. Abbe (Med. News, No. 5, '96).

Thirty-five cases of tuberculous peritonitis treated with laparotomy, followed by recovery in thirty-three. Two cases required a second operation in eight to ten months. The abdominal cavity is merely opened and emptied of fluid. The second operation was of special interest on account of what was found in the abdomen: The tubercles had almost disappeared, around those that were left there was an inflammatory exudation, and inside there was cystic degeneration. Mazzoni (Centralb. für Chir., Feb. 1, '96).

From 70 to 80 per cent. of cases of tubercular peritonitis are curable by abdominal section, although five years should elapse without recurrence before the cure can be called positive. It is doubtful whether irrigation of the peritoneal cavity is desirable; at least only

sterilized water should be used for this purpose. Affected tubes and ovaries should be removed only when this can be done easily. Drainage is unnecessary. Vaginal section is not applicable to these cases. Winkel (*Centralb. f. Gynäk.*, No. 38, '97).

Following conclusions drawn in regard to laparotomy in tuberculous peritonitis:

1. The danger of the operation is very slight (3 per cent.).
2. Infection is less likely to occur than in a healthy peritoneum.
3. Tubercular infection of the wound itself is never observed.
4. It is unnecessary to use any antiseptic for flushing the peritoneum, or to insert a drainage-tube.
5. The operation, even if unsuccessful, does not aggravate the condition of the patient.
6. Tubercular lesions in the lungs are rather an indication for operation than otherwise, since the general condition of the patient is usually so much improved by this procedure. Parker Syms (*Med. Rec.*, Apr., '98).

Case of a girl, aged 20, with tuberculous peritonitis, upon whom laparotomy has been personally performed four times in six months, with the result that for the last four and a half months there has been no sign of recurrence, and the general health has been highly satisfactory. After each operation temporary relief was noticed. Careful microscopical examination of the affected peritoneum was made each time, and as a result of this it is affirmed that cure takes place in these cases by leucocytic invasion, organization of fresh connective tissue, vascular new formation, and substitution of tuberculous tissue by inflammatory neoformations. Washing out the peritoneal cavity does not act in virtue of any particular antiseptic or antituberculous property of the solution, but mechanically by setting up a certain amount of inflammation, and the washing assists this partly through the disturbance which the sponging out of the fluid necessitates. D'Urso (*Il Policlin.*, June 10, '96).

Leaving aside miliary or granular peritonitis peculiar to children, where surgical treatment is not to be thought of, there are three chief varieties of

tubercular peritonitis which are to be treated by laparotomy.

1. Ascitic—serous effusion into peritoneum, sometimes sero-purulent, or even sanguinolent. Here the peritoneum is injected, deprived of its gloss, and sometimes has fibrinous deposits.

2. Ulcerous, or fibrocaseous. This has an abundant production of false membranes, forming considerable thickenings, even tumefactions of the peritoneum. Numerous adhesions exist both between the opposing parts of the peritoneum and between these and the viscera. Here and there are accumulations of sero-purulent liquid, and occasionally softened cheesy masses. In this kind perforations are frequent, and stercoraceous abscesses occur.

3. Fibrinous, or dry, peritonitis. No liquids, but adhesive inflammatory exudates whose fibrinous transformation tends to cause regression of the tubercles around which they form.

In addition to these general forms there are circumscribed forms which also admit of successful handling in this way. Duplaz (*Le Bull. Méd.*, July 6, '98).

As result of invasion of tubercle, the peritoneum becomes intensely hyperæmic, and may sometimes, by its strong reaction, check the spread of infection. More frequently, however, the peritoneal reaction is insufficient. The entire organism becomes progressively enfeebled, and death results.

If laparotomy be performed, and especially if a large incision be made, the peritoneal reaction already existing is rendered much more intense. This hyperæmia continues for many weeks, and terminates generally by checking the tubercular invasion. The exposure to air, chemical reagents, and the evacuation of the fluid, together with the approximation of the peritoneal surfaces, are only of secondary importance. M. Nassauer (*Münch. med. Woch.*, No. 16, '98).

The invasion of the apices of the lungs, serous pleurisy with slight effusion, is not an absolute contra-indication, since these lesions, if commencing and limited, may be cured by the operation. On the contrary, acute miliary tuberculosis, ex-

tensive lesions of the lungs, tuberculosis of the liver, the kidney, or the intestines, tuberculosis in the genitalia being excepted, are contra-indications to the surgical intervention.

The reproduction of the ascites after treatment by laparotomy is treated, according to the circumstances, by a new laparotomy or by repeated punctures, abdominal massage, iodide, collodion, etc., which sometimes succeed in producing a definite cure. Delangree (*Ann. de la Soc. Belge de Chir.*, No. 9, '99).

Tumors of the Peritoneum.—Carcinoma, sarcoma, hydatid cysts, dermoid cysts, and chyle-cysts are among the principal forms of tumor found arising from the peritoneum. These tumors usually develop in the mesentery or the omentum. The dermoid cysts spring from the ovary, but may become separated from it and become implanted on omentum or mesentery. The chyle-cyst arises in the mesentery as a result of occlusion of one or more lacteal ducts.

CANCER OF THE PERITONEUM.—*Symptoms.*—In primary cancer the symptoms during the early part of the disease may be entirely latent or may consist of an uncomfortable feeling and some pain in the abdomen. As the peritoneum becomes more involved, ascites, emaciation, loss of strength, and the characteristic cachexia appear.

These same symptoms are present in secondary cancer, but are more readily recognized as cancerous on account of the disturbances caused by the primary disease.

In both forms the large effusion may result in difficulty in respiration, and rupture of the vessels in the cancer may be followed by severe hæmorrhage, with its accompanying symptoms. On account of the amount of the ascitic fluid, tumor-masses are not easily palpated until after paracentesis.

Diagnosis.—In the primary form,

especially when a large quantity of ascitic fluid is present, it is sometimes almost impossible to establish a diagnosis from tubercular peritonitis with effusion. In secondary cancer the history of malignant disease in one of the organs makes the diagnosis easy. After tapping, or when tumors can be palpated without resorting to this operation, differential diagnosis must be made between this disease and chronic tuberculous and proliferative peritonitis.

In all three diseases the omental tumor is likely to be present, but in cancer enlargement of the inguinal glands is often noted; nodular tuberculous peritonitis occurs usually in children, concerning whom a tuberculous history is often obtainable. Cases of proliferative peritonitis generally give a history of chronic alcoholism.

Echinococcic cysts may be distinguished by the fremitus, the history, the lack of cancerous cachexia, and examination of the fluid. In colloid cancer, although the abdomen may be greatly enlarged, the mass does not fluctuate.

Retroperitoneal tumors are often very difficult to differentiate, but they are generally immovable, while cancerous tumors of the mesentery or omentum are movable and follow the respiratory movements.

Etiology.—Cancer of the peritoneum is usually secondary to cancer of the stomach, liver, uterus, or some other organ. It is more common in women than in men, and is a disease of middle and late life.

Prognosis.—Cancer of the peritoneum always results in death in from a few weeks to several months.

Treatment.—This is only palliative. Pain may be relieved by the opium preparations, and constipation by mild laxatives. If the effusion is so large as to

cause distressing symptoms, paracentesis is to be resorted to, care being taken not to enter an adherent intestine.

SARCOMA.—Sarcoma of the mesentery is of rapid growth and almost always results fatally. Ascites is usually present in these cases. These growths are seldom removed successfully by operation, because they are attacked too late. There is rapid involvement of surrounding structures, making complete removal impossible. A fatal termination is inevitable.

Literature of '96-'97-'98-'99.

Fifty-seven cases of solid mesenteric tumors collected from literature, of which 10 were sarcomas, and the following personal case occurring in a physician, whose illness was of about three months' duration.

Before death diagnosis of cirrhosis of the liver had been made, based on the presence of a large amount of free fluid in the abdomen and inability to palpate the liver or outline it on percussion. Necropsy showed a tumor involving the mesentery and mesenteric glands, with metastases in the head of the pancreas, the greater and lesser omentum, the lymphatic glands at the neck of the gall-bladder, the pleura, and the bronchial and inguinal glands. There was also compression-atelectasis of the lower lobe of the right lung, chronic passive congestion of the spleen, cirrhosis of the liver, and general anasarca. On microscopical examination diagnosis of lymphosarcoma of the mesentery was made. Maximilian Herzog (*Jour. Amer. Med. Assoc.*, Feb. 11, '99).

HYDATID CYSTS of the peritoneum are found in the mesentery, the omentum, and broad ligaments, and are secondary to primary growths of visceral organs: the liver, the spleen, and the kidneys. They cause great pain by traction. The diagnosis is made by a peculiar fremitus; but this sign cannot always be obtained, so that the true condition is seldom

learned until after exploratory incision. The only treatment is coeliotomy. All cysts should be removed when possible or else incised and evacuated, followed by thorough washing and drainage. These cases are often successfully dealt with by operation, the only dangers being those common to the average coeliotomy.

Ascites.

Definition.—Accumulation of fluid in the peritoneal cavity.

Symptoms.—When the abdomen becomes greatly distended with fluid the breathing is interfered with; the heart and liver are pushed upward, causing disturbances of the circulation. Gastro-intestinal symptoms—such as vomiting, constipation, and distension of the intestines with gas—are common; frequent micturition is also noted, the urine being frequently albuminous.

The abdomen presents a rounded appearance, and may sometimes show the *linæ albicantes* and enlarged veins. Fluctuation may be obtained by tapping with the finger-tips of one hand and receiving the impression with the palm of the other, which is placed on the opposite side of the abdomen. Percussion yields dullness, which is found movable as the patient changes his position. If the intestines are much distended with gas, tympanic resonance will be obtained.

Diagnosis.—The diagnosis of ascites is usually not difficult, especially when the accumulation of fluid is large. The abdomen is distended and the skin smooth and shining. When the patient is lying on the back the greatest bulging is in the flanks when there is dullness on percussion over the fluid. The small intestines floating on the top of the fluid give a tympanitic note on percussion in the umbilical region. These signs necessarily change when the patient assumes

different positions. In the erect posture the dullness may reach the level of the umbilicus in front and in the axillary lines. When the patient lies on one or other side the tympanitic note is found in the opposite flank.

Literature of '96-'97-'98.

Tympany in the flanks may be observed with considerable frequency in ascites even when the effusion is of considerable size. Tyson (*Jour. Amer. Med. Assoc.*, Aug. 7, '97).

Ascites is to be distinguished from ovarian and other cysts, pregnancy, and distended bladder. Bearing these possibilities in mind, we will seldom make mistakes. In ovarian cyst there is seldom bulging in the flanks where we have a tympanitic note on percussion instead of dullness. There is dullness on percussion at and around the umbilicus. In other words, the tumor displaces the intestines and seems to rest upon them, whereas in ascites the intestines float on the surface of the fluid. In ascites vaginal examination often shows that the uterus is movable.

In diagnosing ascites from chronic peritonitis, a previous history of disease of the liver, heart, or kidneys; symmetrical enlargement of the abdomen; absence of hard masses upon palpation, and little or no pain would favor the former.

In pregnancy the only sign in common with ascites is enlarged abdomen. Distended bladder with incontinence from retention is sometimes mistaken for ascites. In doubtful cases the patient should always be catheterized.

The appearance and nature of the peritoneal fluid depends upon the cause of its formation. By aspiration we can often determine this cause. Pure ascitic fluid, due to cirrhosis of the liver, is clear and serous. Blood-stained fluid

may be due to cancer, tuberculosis, or ruptured extra-uterine pregnancy. The amount and appearance of the bloody fluid are aids in the differential diagnosis.

Chylous fluid caused by disease of the lymphatics is occasionally found free in the abdominal cavity. It is said to be due also to excessive milk diet and to filaria.

Etiology.—Ascites is not always due to disease of the peritoneum. It is often a symptom of disease of the liver or disturbance of the circulation of the portal veins, by compression or inflammation. It generally accompanies cancerous or tuberculous disease of the peritoneum and malignant disease of the abdominal organs, and is sometimes associated with benign tumors. It is said to be caused by freely movable, large, pedunculated fibroid tumors of the uterus. As a rule, when ascites is associated with tumor we may safely diagnose malignancy. The causes of ascites enumerated have been studied under their respective heads.

Treatment.—The medical treatment consists in administering hydragogic cathartics and diuretics, of which bitartrate of potassium is one of the best. Calomel and digitalis may also afford relief. Tonics should be employed to raise the general health of the patient, and the ingestion of fluids should be restricted.

When the amount of fluid is large, puncture of the abdomen must be resorted to and repeated at varying intervals. According to Fitz, this puncture should be made in the median line midway between the symphysis and navel, or on either side midway between the symphysis and antero-superior spine. A straight trocar $\frac{1}{8}$ inch or less in diameter, previously cleaned by heat, should be used. It should be made evident by previous percussion that a coil of intestine does not lie directly beneath where the patient is to be tapped. Every anti-

septic precaution is to be taken before and during the operation.

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PERNIO (CHILBLAIN).—Pernio is an erythematous local inflammation and swelling of the skin due to cold. (See also ERYTHEMA.)

Symptoms.—In the majority of cases there is slight redness, swelling, itching, and burning of the part. These symptoms all become intensified in severe cases, and the inflammation may be so great that vesication and ulceration result.

Chilblains may be followed by a general tumefaction of the regions attacked, which is the result of local asphyxia even more than of chilblains themselves. In the hands and toes this tumefaction gives a peculiar sausage-like aspect to the parts, somewhat like that resulting from acromegaly. Another consequence, still more rare, of chilblains is the production of localized and persistent vascular dilatations, true acquired capillary angiomas, on which there are small papillomata resembling warts.

Etiology and Pathology.—Defective or insufficient alimentation facilitates the development of chilblains; inactivity also assists; cold, aided by defective conditions of circulation and of functions of the economy, is their main cause. It exerts still greater effects when the skin is wet or not properly dried, or when it is suddenly succeeded by heat. Chilblains may often be prevented if the parts which have been exposed to the cold are slowly and progressively warmed. (Thibierge.)

The relation between the lymphatic constitution and a predisposition to chilblains is ascribed by A. E. Wright (*Lancet*, Jan. 30, '97) to a lymphatic consti-

tution, due, in turn, to a water-logging of the tissues through an excessive transudation of lymph. A slight increase of transudation converts such a condition of the tissues into perfectly definite hæmatomata such as are seen in chilblains. The subjects of malarial cachexia are not infrequently also the subjects of chilblains, which are also of very frequent occurrence in hæmophilic families.

Treatment.—The obvious indication in a case of chilblains is, according to Wright, to increase the patient's blood-coagulability, and in conformity with these indications patients are to be placed upon a regimen of calcium chloride, after duly cautioning them against lowering their blood-coagulability by the ingestion of sour fruits, alcohol, or excessive quantities of fluid.

A solution of acetate of zinc, one drachm to the pint of water, applied to the foot will, according to G. J. Monroe, give almost instant relief.

Codliver-oil, preparations of iodine, iron iodide, and arsenic are indicated in all cases. M. Brocq (*N. Y. Med. Jour.*, Jan. 30, '97) obtained good results from the association of quinine sulphate and of ergotine (in doses of from $\frac{3}{4}$ grain to 3 grains) with powdered digitalis (from $\frac{1}{5}$ to $\frac{1}{3}$ grain) and the extract of belladonna ($\frac{1}{2}$ grain) in the form of pills, the employment of which was prolonged during the entire winter. Inhalations of oxygen are indicated in subjects in whom the sluggish condition of circulation predisposes them to chilblains. Regular exercise, walking, gymnastics, cold affusions, and general stimulating lotions are also extremely useful prophylactic means in the majority of subjects. The hands should be covered with thick and sufficiently warm gloves, but rough woolen gloves should be avoided. They, like the

feet, should be washed in warm water (not in cold) and carefully dried on a towel (never before a fire), and then powdered with starch or talcum in order to remove every trace of dampness. The hands should not be allowed to remain too long in cold or soapy water. Shoes and stockings should be comfortably large; they should be thick enough to protect the feet against the action of the cold. If sweating accompanies the chilblains, repeated foot-baths must be resorted to. Foot-baths containing small quantities of astringent decoctions of walnut-leaves, of ash-leaves, of eucalyptus-leaves, of oak-bark, etc., of from five to six minutes' duration, constitute a very useful means of preventing frost-bites. When the lesions are due to hyperæmia with little or no infiltration of the skin, zinc-oxide ointment, such as the following, to which has been added a small quantity of carbolic acid or menthol, will suffice to allay the pruritus and cause the rapid disappearance of the lesions:—

℞ Zinc oxide, 150 grains.
 Carbolic acid, 8 grains.
 Vaseline,
 Lanolin, of each, 225 grains.—M.

If there is active inflammation, the preferable treatment is with an ointment containing lead salts, such as the following:—

℞ Lead subacetate, 30 grains.
 Carbolic acid, 8 grains.
 Zinc oxide, 225 grains.
 Vaseline,
 Lanolin, of each, 300 grains.

When chilblains resist these topical applications, ointments containing silver nitrate, or painting with 50-per-cent. solution of silver nitrate or with the tincture of iodine, often hastens their resolution. If blisters form they should

be opened aseptically and covered with a dressing of vaselin and boric acid, or with freshly-prepared carron-oil to which has been added 2 per cent. of carbolic acid. If these blisters have been ruptured, or the chilblains are ulcerated, after bathing the parts with a weak solution of corrosive sublimate they should be covered with a dressing of vaselin and boric acid, or with non-irritating plasters, such as zinc oxide, simple boric acid, and dermatol plasters, or Vidal's red plaster. If the ulcerations do not disappear they should be touched every two days with a silver-nitrate stick, or with tincture of iodine, and dressed with camphorated brandy, with Van Swieten's solution diluted one-half with water, or with aromatic wine. These dressings should be carefully applied, particularly on the toes and between the fingers, where, according to M. Besnier, it is well to place small tampons of absorbent cotton.

Boeck states that resorcin is efficacious in treatment of chilblains, especially when associated with ichthyol and tannic acid, as follows:—

℞ Resorcin, 1 part.
 Ichthyol, 1 part.
 Tannic acid, 1 part.
 Water, 5 parts.

The affected parts are painted with this liquid every evening, the bottle being well shaken before using. When the occupation of the patient is such as to absolutely preclude the use of substances which blacken the hands, recourse may be had to the following preparation, less efficacious than the above, but which gives very good results.

℞ Resorcin, 8 parts.
 Powdered acacia, 5 parts.
 Water, 15 parts.
 Talcum, 2 parts.

A layer of this mixture is applied to

the affected parts every evening, the bottle being well shaken before using.

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The following formula of value in rebellious chilblains:—

℞ Solution of lead subacetate,
Tincture of iodine,
Tincture of opium, of each, 5 parts.
Starch, 10 parts.
Glycerin, 140 parts.

Chéron (*Jour. de Méd. de Paris*, Mar. 28, '97).

In treatment of chilblains the secondary current of the faradic battery may be successfully used by applying it from five to fifteen minutes, the current being gradually increased to high strength, the poles being in contact with the affected area, the electrodes having been previously dipped in a saturated solution of sodium chloride. The tissues are gradually blanched, commencing after about five minutes. The itching is completely and promptly stopped by the first application, and a second, one or two days afterward, usually suffices for a cure. Seldom, if ever, does a third or fourth application become necessary. F. W. Forbes-Ross (*Lancet*, No. 3832, p. 425, '97).

For treatment of chilblains the electric bath applied in the following manner advised: An induction-coil is used and the wires are attached to 2 metallic plates placed at the two ends of an ordinary earthenware foot-bath filled with warm water. This bath should be used at bed-time for ten or fifteen minutes, whenever the slightest threatening of chilblains is noticed. The current is employed as strong as can be borne without discomfort. The procedure should be repeated for eight or ten consecutive nights. H. Lewis Jones (*Lancet*, Jan. 14, '99).

PERTUSSIS (WHOOPIING-COUGH).

Definition.—An acute infectious disease manifesting itself, at the onset, by catarrhal symptoms confined chiefly to the upper respiratory passages, larynx, and trachea, and of which the cough

toward the end of the second week assumes a peculiar convulsive character known as the “whoop.”

Symptoms.—After a variable incubation-period of from five to thirteen days, the symptoms of a more or less severe coryza present themselves: a coryza at the onset unable to be distinguished from that due to other diseases. The cough at this period is not characteristic; gradually, however, it assumes a paroxysmal character and is more frequent during the night than is the case with a cough due to ordinary causes. At this stage it is seldom that any adventitious sounds are to be heard in the chest.

Toward the end of the second or during the third week the characteristic cough develops. The child recognizes its oncoming and endeavors to suppress it, or runs to its mother or nurse for support; a series of quickly-repeated short coughs bursts forth and persists until the chest is in a state of extreme expiration; the face becomes congested and cyanotic, and the eyes suffused; then follows the long-drawn inspiration accompanied by the characteristic “whoop.” This may be repeated two or three times. The paroxysm generally ends with the expulsion of a large quantity of clear, thick, tenacious mucus from the upper part of the throat. Vomiting, with complete unloading of the stomach, frequently takes place at the same time. In delicate children, and especially in infants, these paroxysms produce great exhaustion, and the little patient falls back with lived face and pulse almost uncountable; the great strain may also induce tenderness of the respiratory muscles.

The frequency with which these paroxysms occur varies much according to the period in the disease and the severity of the attack. In mild cases, eight or ten, in severe cases twenty or thirty, may oc-

cur during the twenty-four hours. Their severity is also variable. Both the frequency and severity of the spasms are greatest during the first two weeks of the spasmodic stage, after which they gradually lessen. In some undoubted instances of the disease the characteristic whoop is quite absent. The disease generally runs a longer and more severe course during the late autumn and winter months than during the spring and summer. Impure air, cool draughts of air, and the recumbent posture are apt to increase the frequency and severity of the spasms. The total duration of the disease varies from two or three weeks to eight or ten. The presence of adenoid vegetations in the naso-pharynx adds to the severity and duration of an attack.

Pertussis does, on rare occasions, attack persons of adult age; in such the spasms are not so severe, the whoop is seldom characteristic, and complications are infrequent.

Diagnosis.—During the early catarrhal stage it is difficult, except in those cases in which we know there has been a direct exposure, to distinguish between pertussis and a catarrhal condition arising from other causes. Toward the close of the catarrhal stage, the spasmodic character of the cough, its frequency and severity during the night, the suffusion of the eyes, and puffiness of the lower lids, are all suggestive symptoms, but not absolutely diagnostic. Slight ulceration of the frænum linguæ due to the violence of the cough frequently occurs in young infants in whom the incisor teeth have been cut.

After the second week the cough generally becomes characteristic and is easily recognized by the attendant. A paroxysmal cough closely resembling that of whooping-cough may be induced by enlargement of the bronchial glands. In

early infancy laryngeal spasm producing stridor closely resembling the whoop of pertussis may be due to a catarrhal laryngitis.

Literature of '96-'97-'98-'99.

Blood examined in 55 cases of whooping-cough, and constant leucocytosis, sometimes considerable in amount, found. In 32 of the cases the leucocytes numbered more than 20,000 in the cubic millimetre. The number was highest in the third and fourth weeks of the disease, when the fits of coughing were at their worst. This corroborates the view that whooping-cough is a general, and not a local, disease. Frohlich (*Jahrbuch f. Kinderh.*, vol. xlv, No. 1, p. 53, '97).

Hacking cough regarded as true pathognomonic phenomenon of the entrance into the body of the toxic agent of whooping-cough. The longer the period of incubation (*i.e.*, the greater the resistance of the system), the greater the infection and the severer and more prolonged will be the sickness; while the shorter the incubation, the milder the disease and the more brief the period of its duration. Illoway (*Pediatrics*, Jan. 15, '99).

Etiology.—The clinical history of the disease points strongly to the existence of a specific organism to which the catarrhal and nervous symptoms may be more or less directly attributed; but, so far, pathologists have not determined with certainty the exact micro-organism. Afanassiew in 1887 announced that he had found a characteristic bacillus in the sputum of children suffering from this disease. This discovery was confirmed by a few observers, and for a time his bacillus was regarded as the exciting organism; since then, however, doubt has been thrown upon his conclusions. In 1896 Kurloff described a ciliated protozoön of variable size which he considered to be the specific organism. A year later Koplik described a slender bacillus somewhat

resembling the bacillus of influenza. In December of the same year Czaplewski and Hensel described a short bacterium, somewhat resembling a diplococcus, which they regarded as the same organism described by Koplik, but they are not certain as to its identity with that of Afanassiew. Still later, Behla comes to the same conclusion as Kurloff, that the specific micro-organism belongs to the protozoa, and is not of a bacterial nature.

Thus it appears that several micro-organisms have been found with sufficient frequency in the sputum of children suffering from pertussis to be regarded as the exciting cause, but at the present no one germ is universally recognized as such. The contagium is thrown off from the respiratory tract, chiefly in the sputum; the disease appears to be readily communicated through the air even for a considerable distance, and appears to be specially contagious during the early catarrhal stage.

Literature of '96-'97-'98.

When the sputum is examined during the convulsive stage there is found constantly present a very minute bacterium. It is seen sometimes in the epithelial cells. It grows on most of the ordinary media; best, however, in hydrocele fluid. It is both anaërobic and aërobic. It is a minute, thin, short bacillus; it stains with the ordinary aniline dyes; and is not decolorized by Gram's method. It is somewhat toxic to white mice, but produces no symptoms of whooping-cough in them. Koplik (Johns Hopkins Hosp. Bull., Apr., '98).

Bacillus constantly found in the sputum of 25 children suffering from pertussis. It is a short oval rod, one and one-half to two times as long as it is broad, and the centre stains imperfectly. Generally it is present in large numbers. A thorough washing of the particles of mucus is essential before attempts are made at cultivation. Best medium is a

glycerin-agar made with anasarcaous fluid. Colonies are moderately small, round, slightly raised, gray or grayish white, and finely granular. Growth is less marked on ordinary glycerin-agar or on agar or glucose-agar, and it does not grow better on blood-serum-agar than on glycerin-agar. In broth cultures there is no turbidity after twenty-four hours, but a sediment sinks to the bottom of the tube. There is no film on the surface. Gelatin is not liquefied. The microbe is non-motile, forms no spores, and is but slightly resistant to high temperatures. It is a facultative anaërobe, and is mostly decolorized by Gram's method. Grape-sugar is not fermented, nor milk coagulated by it. It does not give a serum-reaction. Experiments on animals were negative.

In two cases diagnosis was made by examination when there was clinical uncertainty. Czaplewsky examined specimens, and agreed that the microbe was exactly the same as that found by him. Thus, Czaplewsky and Hensel's observations are independently confirmed. Zusch (Münch. med. Woch., June 7, '98).

Like other infectious diseases whooping-cough generally occurs in epidemics, which are more frequently met with during the spring and autumn months, and in a peculiar way are frequently associated with epidemics of measles. The majority of cases occur in children under the age of four years; it is seldom met with in children over twelve years; in early infancy it is peculiarly severe and fatal.

Literature of '96-'97-'98.

Observations in epidemics including 1163 cases of whooping-cough showed that strong children seemed more disposed than weak ones. Five children had second attacks, and 37 who were exposed to the disease at one time without taking it contracted it at a subsequent exposure. In the sputa of 147 patients examined Ritter's diplococcus tussis convulsivæ was found in every instance. Ritter (Arch. f. Kinderh., B. 20, H. 3 and 4, '96).

Pathology.—In simple uncomplicated cases, beyond a catarrhal inflammation of the larynx and trachea little is to be noted. In severe cases the inflammation may extend to the smaller bronchi. In fatal cases the tracheal and bronchial glands are found enlarged; more or less extensive catarrhal pneumonia is generally present; frequently we find collapse of lung with associated emphysema.

Complications and Sequelæ.—In every case of whooping-cough more or less tracheitis is present, which, under imperfect hygienic conditions or undue exposure, readily becomes converted into a bronchitis, adding to the violence of the symptoms. It becomes still more serious if a broncho-pneumonia develops: a condition indicated by sudden rise of temperature and increased dyspnoea. This complication adds greatly to the fatality of the disease. Some emphysema of the lung is probably developed in every serious case; a few instances have been noted where emphysema of the cellular tissue of the mediastinum has occurred: a condition which may go on to general subcutaneous emphysema and death. The digestive system is in every case apt to be more or less deranged; vomiting in some cases is a troublesome complication, and may interfere with necessary nutrition. A catarrhal condition of the intestines producing diarrhoea is liable to occur in infants during the summer months.

In all children an attack of pertussis appears to induce an increased irritability of the spinal and cerebral centres. Convulsions are liable to occur, due in some instances to merely temporary causes; in others to serious cerebral lesions such as intracranial hæmorrhage or thrombosis, and followed by more or less extensive paralysis, and sometimes by disturbances of sight and hearing. Hæmorrhage due to mechanical causes is not infrequent;

epistaxis occurs frequently; subconjunctival hæmorrhage is more rare; intracranial hæmorrhage is generally meningeal, intracerebral being distinctly less frequent.

Literature of '96-'97-'98-'99.

Case of whooping-cough in a 2-year-old female, who was seized with inability to move any of her extremities immediately after a severe attack of coughing. She also had incontinence of urine and fæces. There was paresis of the right side of the face. After this each attack of coughing was accompanied by general convulsions.

There was high fever. Child gradually recovered. Diagnosis was a meningeal hæmorrhage.

Thirty-eight cases collected from the literature in which there was a cerebral hæmorrhage. Ten of these were fatal, and sections were performed in these cases.

In the majority of cases they recover, but may be followed by various nervous disturbances. Treatment is of little avail. Schreiber (*Archiv f. Kinderh.*, vol. xxii, pts. 1 and 2, '99).

Among the more important sequelæ of the disease are various chronic pulmonary affections: emphysema, chronic bronchitis, asthma, atelectasis, and chronic interstitial pneumonia. It is to be remembered also that after an attack of whooping-cough has run its course latent tuberculosis and syphilis may suddenly show indications of activity, the heart may show signs of overstrain, and a condition of undue nervous irritability may persist for many months.

During recent epidemic of whooping-cough occurrence of albuminuria noted in from 10 to 12 per cent. of the cases, and a mortality of 5 to 6 per cent. from acute nephritis. The urine should be frequently examined during this disease. Stefano Mircoli (*Archivio per le Sci. Med.*, vol. xiv, No. 1, '90).

There is danger of dilatation of the right heart in severe cases of pertussis.

a venous stasis first occurring from inflammation of the finer tubes and broncho-pneumonic foci, with overloading of the right heart and the general venous system. Silbermann (*Archiv f. Kinderh.*, B. 18, S. 24, '95).

Prognosis.—Pertussis is more to be dreaded during the winter and early spring months than during summer. The mortality is very high when an attack develops during early infancy, especially in rachitic children, in tubercular children, or in children suffering from adenoid growths in the naso-pharynx. The disease assumes a specially fatal character in foundling-asylums and hospitals where broncho-pneumonia of a severe type is liable to develop. In children over six years of age, serious complications are rare.

Treatment.—Treatment of this disease is, by general confession, not satisfactory. While it is among the hopes that may be realized in the future, that we shall be able to limit the duration and severity of an attack by some antitoxin, at the present no internal medication appears to be able to effect any distinct reduction in what may be regarded as the typical course of the disease. Nevertheless, by careful hygiene and judicious management we may do much to lessen the number and severity of the spasms and prevent complications.

The patient should breathe a pure air not too dry, the temperature of which should not be allowed to vary much from 65° F. Cold draughts, strong winds, and sudden atmospheric changes are to be avoided as liable to increase the catarrhal conditions present and give rise to severe pulmonary complications. During the cold season of the year it is well to confine the patient strictly to two rooms, one of which should be thoroughly aired while the other is occupied. General baths should be omitted; the child should

be dressed warmly, and so long as any fever be present it should be kept in bed. Nutrition must be maintained; the diet should be nourishing, but simple and digestible. If vomiting recurs frequently, food must be given in small quantities and at short intervals. Excitement of all kinds is to be avoided.

A threatening paroxysm may be arrested sometimes when in the house by carrying the child to an open window, where it takes several deep inspirations.

The fresh-air treatment is one of the most efficacious, if not the only one, for the management of a case of whooping-cough. The child should pass the entire day out-of-doors, not only in the warm season, but even at all times of the year, provided it be not stormy. It is considered only necessary to prevent the child from running or talking or otherwise provoking an access of coughing. Ullmann (*Jahr. f. Kinderh.*, etc., B. 40, H. 1, '95).

Theoretically, antiseptics should occupy a prominent place in the treatment of this disease, and many attempts have been made to modify the course of an attack by the topical application of such drugs. Moncorvo claims much benefit from the application of 1- or 2-per-cent. solution of resorcin to the nasal passages, pharynx, and larynx by means of a brush or spray.

Literature of '96-'97-'98.

Two hundred and ninety children suffering from whooping-cough treated by method introduced by Moncorvo, namely: by applications of a 2- to 3-per-cent. solution of resorcin to the glottis with a fine sponge. The resorcin is to be used without previous cocaineization. In the 290 cases treated no other therapeutic measure was employed. Children under two years of age seemed to get well more easily than older ones. After a few applications by the practitioner the treatment is carried out by those in charge of the patient. Roskam (*Ann. de la Soc. Méd.-chir. de Liège*, Feb., '97).

Special bacillus of pertussis is destroyed in its chosen home, the larynx, by swabbing the periglottic region with a 10-per-cent. solution of citric acid with simple syrup. It also constitutes an effective prophylaxis against infection. Disease prevented in many children living with others infected by this means, or merely by the administration of small quantities of citric lemonade during the day. Resorcin and asapol considered the most effective among other remedies. Moncorvo Filho (Therapist, May 14, '98).

Rabinschek also speaks well of the results obtained from swabbing the pharynx and epiglottis with a solution of mercuric chloride 1 in 1000.

Literature of '96-'97-'98.

A small tampon of cotton saturated with a 1 to 1000 solution of corrosive sublimate is to be introduced into the back of the mouth and pressed against the lower part of the tongue in such a way that the liquid will bathe the epiglottis and the neighboring mucous membrane.

This method, with which good results have been obtained, was applied in 71 cases of whooping-cough by Rocco Gentile; 35 patients were cured after from three to twelve applications; 13 were considerably ameliorated, and the others interrupted the treatment or complications supervened which did not depend upon the whooping-cough.

One of the greatest benefits to be derived from this treatment is the rapid cessation of the vomiting which contributes so much to weaken the patients, who lend themselves very readily to the treatment and become rapidly accustomed to the introduction of the tampon. Rabinschek (Bull. Méd. de Paris, Sept. 13, '97).

Nasal insufflations of powders containing quinine have also been strongly recommended. The great objection to such therapeutics is that every application is resisted to the utmost by the child, the mere sight of the brush or spray throwing it into a state of terror. The inhala-

tion of an antiseptic vapor is a much easier method of attaining the same object. Creasote, carbolic acid, cresolin, eucalyptol, or thymol may in solution be readily volatilized by heat and its vapor be diffused through the air and inhaled unconsciously by the little patient. By this method we obtain not only an antiseptic, but an anæsthetic, action on the respiratory passages, and may unquestionably lessen the frequency and severity of the spasm. The best results are obtained when the patient is made to breathe a strongly-charged atmosphere for one or two hours two or three times a day; but caution must be exercised lest irritation of the kidneys be induced. It is also to be remembered that no antiseptic medication will take the place of pure air.

Naphthalin-vapor employed with brilliant results, causing a rapid diminution in the cough and cure of the disease: $3\frac{3}{4}$ to 5 drachms of naphthalin should be placed in an earthen dish, and heat applied so that the drug will be slowly vaporized. The fumes are pungent and provoke cough. Use of this agent is contra-indicated in subjects suffering from tuberculosis. Chavernac (Med. Age, Aug. 25, '92).

Literature of '96-'97-'98.

About 20 grains of menthol should be dissolved in 1 ounce of liquid vaselin in an ordinary nasal spray-producer; as soon as a paroxysm begins, or preferably as soon as the patient feels that one is impending, a fine cloud of spray is diffused in front of the face, the spray-producer being held about two feet away; by this means the air in front of the nose and mouth is saturated with the oily particles, and at each inspiration they are drawn into the air-passages; this is quite painless, but occasionally a slight spasm of the glottis occurs. The effect of this inhalation is quickly seen, for the mucus is rapidly expectorated and the paroxysm is soon over, so that convulsions are less frequent and vomiting is rare, with the result that the pa-

tient loses his dread of taking food and eats with a better appetite, his general condition being thus kept at a much higher level. S. A. Bontor (W. London Med. Jour., July, '97).

Satisfactory results obtained in treatment of whooping-cough by inhalations of ozone. These inhalations may be given for ten or fifteen minutes twice a day. Caillé reports seven cases and Labbé and Oudin fourteen or fifteen cases in which rapid recovery was obtained with this mode of treatment. M. E. Doumer (Nord Méd., Nov. 1, '97).

New form of treatment for whooping-cough. Consists in making inhalations of oxygen saturated with vapors of bromoform and camphor monobromate. Apparatus consists of a bag filled with oxygen and connected by means of a rubber tube with a saturator containing pieces of pumice-stone; a second tube, terminating in a bone nozzle, completes the apparatus. The pumice-stone is first saturated with a solution of bromoform in cherry-laurel water, and placed in layers in the saturator, each layer being well dusted over with powdered monobromated camphor, $2\frac{1}{2}$ drachms of each of the medicaments being usually employed. The nozzle being inserted between the teeth of the child, a slight pressure forces the oxygen through the saturator, and, charged with the medicated vapors, into the respiratory organs. Lacroix (Sem. Méd., xviii, p. 130, '98).

Internally, sedative and antispasmodic medicines may be administered with the object of allaying the nervous irritation and checking the spasm. Among the most generally employed are the bromides, belladonna, antipyrine, and chloral-hydrate.

Belladonna prized as a most powerful remedy in whooping-cough. To produce cure remedy is given in a dose sufficient to produce erythema after every dose. Infants of 6 to 8 months require $\frac{1}{6}$ grain of either the root or the alcoholic extract, three times a day; children of 3 or 4 years tolerate three doses each of $\frac{1}{2}$ grain. Medicament is given as a powder, or the extract may be dissolved and sweetened, or the tincture of bella-

donna may be used; child of 2 years may take three doses daily, the first of which may be 6 drops. If the flush be perceptible in twenty to thirty minutes, that is the dose; if not, the number of drops must be increased to obtain this effect after each dose, and in a few days larger doses will be required. Jacobi (Archives of Ped., July, '89).

If antipyrine be administered in the convulsive stage it will abort the disease on the third or fourth day. The dose should be $1\frac{1}{2}$ grains for every year of the child's life, given three times daily. Ree (Deut. med. Woch., No. 19, '90).

In 300 cases of whooping-cough treated with antipyrine very good results obtained. Dubousquet-Laborderie (La Sem. Méd., Apr. 30, '90).

Employment of antipyrine and digitalis advised to protect the patients from the deleterious effects of paroxysm on the heart and circulation. Antipyrine should be given in doses of 1 grain for each year, the maximum dose being 5 grains. Digitalis, 1 minim of the tincture for each year, the maximum dose being 4 minims. Koplik (Archives of Ped., Oct., '93; Knight (N. Y. Med. Jour., Sept. 30, '94).

In England essence of amber (*oleum succini*) is a popular remedy in whooping-cough, being rubbed over the vertebral column morning and evening. William Murrell (Brit. Med. Jour., Apr. 1, '93).

Hot poultices as suggested by J. Madison Taylor recommended in pertussis. The poultice is made large enough to cover the posterior surface of the lungs, and on this the child is permitted to lie for one hour without a change. Relief is almost immediate. After an hour it is removed and into the relaxed skin is rubbed some stimulating preparation, as sweet oil and camphor, or turpentine and lard in the proportion of 1 to 15. After this a cotton jacket is applied. One application a day ordinarily suffices, but the poultice should be repeated as indicated. Three ends are achieved by this treatment: 1. It secures rest. 2. It reduces temperature. 3. By relieving congestion pain is lessened. McKee (Phila. Polyclinic, Sept. 14, '95).

Literature of '96-'97-'98-'99.

Phenocoll hydrochlorate valuable in pertussis, 42 cases being successfully treated. Dose varied from 0.07 to 2 grammes daily, given in mucilage or water, in which it is soluble in the proportion of 1 to 7. Good effects were noticeable within twelve hours. Vargas (Ther. Woch., Jan. 5, '96).

Large number of cases of whooping-cough successfully treated by ichthyol. Remedy is administered in the form of a pill, commencing with doses varying from $\frac{3}{4}$ grain to 3 grains, according to the age of the child, and gradually increasing the dose to 15 grains daily. Internal administration of the drug is supplemented by inhalations of a 3-per-cent. solution of ichthyol in glycerin. It is a most effective drug in the treatment of whooping-cough, not only relieving the violence of the paroxysms, but also cutting short the duration of the disease. Cervasato (Die Ther. der Gegenwart, B. 37, '96).

Trional is much superior to belladonna in the treatment of pertussis. In doses of $1\frac{1}{2}$ to 8 grains—according to the age of the child—it produces a quiet and deep sleep only occasionally interrupted by a fit of coughing. In conjunction with the trional, the pharynx is painted with a 1-per-cent. solution of carbolic acid (containing also a small amount of glycerin and alcohol). Busdraghi (Vratsch, vol. xix, p. 228, '98).

As a substitute for resorcin in pertussis, asaprol—a soluble derivative of betanaphthol—now used in form of an aqueous solution of the strength of 1 to 100, being applied by means of a brush with a long curved handle to the posterior pharyngeal walls and about the region of the glottis, every two hours in the day. In twenty-six cases ranging in age from 1 month to 9 years, in which the remedy has been applied from the beginning of the attack, the case has been cured before the convulsive stage was reached, and in those cases in which this stage had been reached, recovery followed in from five to ten days. In the beginning it induces attacks, but this is very shortly overcome. Moncorvo (La Méd. Infant., Jan., '98).

Formalin used in the treatment of whooping-cough for the past year. Personal experience shows it is a specific in this affection. Treatment is local and is applied to the throat in not too strong solutions; strength used not stated. H. S. Oliphant (N. Y. Med. Jour., Mar. 4, '99).

Bromoform has been very strongly recommended by many writers. It is generally given in alcoholic solution made into an emulsion with gum arabic and syrup, but much caution must be exercised, as the bromoform is liable to be precipitated and thus be present in poisonous amount in the last doses in the bottle. A better plan is to order it to be dropped on a lump of sugar and given in this way to the child. It is not suitable for young infants.

Bromoform is superior to any remedy yet proposed for whooping-cough. Following formula employed in seventy cases with good results:—

R. Bromoform, 10 grains.
Alcohol, 1 drachm.
Syrup, $\frac{1}{2}$ ounce.
Aque, 3 ounces.

M. Sig.: One teaspoonful every hour. Stepp (Allgemeine med. Central-Zeit., No. 62, '89).

Bromoform tested in clinic in one hundred cases, and it is considered almost a specific. Good effects were gradually noticeable from the second to the fourth day. Senator (Wiener med. Woch., No. 26, '90).

Action of bromoform in the treatment of whooping-cough studied. Of 30 children, varying in age from 3 months to 8 years, only one died, whose condition was already very desperate before the beginning of the treatment, owing to complication of capillary bronchitis. In other cases results were very satisfactory. Bromoform administered in form of an emulsion, mixed with gum tragacanth, syrup, and water. Burton-Fanning (Practitioner, Feb., '93).

Literature of '96-'97-'98-'99.

Bromoform is one of the most valuable drugs in pertussis. As it is soluble only in alcohol and glycerin, its administration is sometimes a little difficult, but it can be prescribed with an emulsion of almond-oil and mucilage flavored with orange. The child may get up to 3 drops if about 6 months old; 8 drops when 2 years old; and when over 5 years of age from 20 to 30. First symptom of intolerance is drowsiness. During the first stage of its administration the attacks of whooping-cough may be slightly more marked, after which they subside. Bromoform has no injurious action upon the broncho-pneumonia. Cases of whooping-cough should remain absolutely in-doors, but it is advantageous to change the case into a different room for the night. So soon as the whooping character of the cough has disappeared, change of air is recommended, especially to the sea-side. Marfan (*Jour. de Méd.*, Mar. 10, '98).

Whooping-cough treated with bromoform for the last six years with remarkable benefit in some cases, while the drug did not seem to affect others. The poisonous effect of the drug must be strenuously guarded against. The practice of giving it in drop form is not safe. Cohn (*Ther. Monats.*, Jan., '99).

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PETROLEUM. — Petroleum (rock-oil, coal-oil, mineral oil) is found in various regions of the world. In the natural state it varies in color from a light green or red to black, more rarely clear. It has a distinctive odor. Some specimens have a very offensive odor due to the presence of numerous sulphur and phosphorus compounds. Barbadoes tar, Seneca oil and Rangoon oil are thick varieties. The Rangoon oil contains a larger proportion of both the olefin and the benzol series than American oil. Petroleum does not saponify. It is soluble in fixed and volatile oils and in ether, in 64

parts of boiling absolute alcohol, but is nearly insoluble in water and in chloroform. It is a solvent for India-rubber and many resins. By fractional distillation and purification it yields a variety of commercial products, the lighter oils being useful as solvents, the heavier being used for light, fuel, and lubrication.

All that portion which distills over at or below 122° F. is designated benzin, or naphtha. Hydrocarbons of greater volatility are obtained from naphtha by repeated fractional distillation. Rhigolene is obtained by distillation from naphtha, distilling over at 64.5° F.

By distilling off the lighter and more volatile portions of American petroleum and purifying the residue, petrolatum, or petroleum-jelly, is obtained. Petrolatum is an amorphous pale-yellow to white, odorless, tasteless, or nearly so, transparent, fatty substance, more or less fluorescent. Petrolatum is sold as cosmolin, vaselin, albolene, etc. It does not become rancid, and is in most cases a valuable substitute for lard in the preparation of ointments. It can also be obtained as a semiliquid or liquid oil.

Preparations and Doses. — Petroleum (rock-oil), crude, 1 drachm; refined, 10 to 30 drops.

Petrolatum liquidum, U. S. P. (liquid petrolatum).

Petrolatum molle, U. S. P. (soft petrolatum).

Petroleum spissum, U. S. P. (hard petrolatum; consistency of a cerate).

Benzinum, U. S. P. (petroleum-ether, or petroleum-benzin), 10 to 30 minims, in mucilage or capsule.

Rhigolenum (rhigolene; used in spray for local anæsthesia and thermocautery).

Physiological Action. — Petroleum when taken internally in small doses is stimulant, antispasmodic, diaphoretic, antiseptic, and expectorant. It disin-

fects the gastro-intestinal and respiratory tracts. In large doses it gives rise to headache, vertigo, pain in the stomach, palpitation of the heart, vomiting, and tetanic spasm.

Poisoning by Petroleum.—In poisonous doses it produces a burning sensation throughout the alimentary tract. The excreta are covered with oil. The skin becomes cold; the pulse feeble, but regular; the respiration sighing, with great thirst and restlessness. Death may occur by collapse from failure of respiration and circulation.

Literature of '96-'97-'98.

In a case of petroleum poisoning in a child of 1 $\frac{3}{4}$ years, the gait became ataxic. The child became semiunconscious, as if thoroughly drunk; the pulse rapid and irregular, the respirations very rapid, and the temperature subnormal. Symptoms improved after lavage. H. Conrads (Berl. klin. Woch., Nov. 2, '96).

In petroleum poisoning a distinction must be made according as to whether the petroleum-vapor is inhaled or the oil has been rubbed into the skin or has been taken internally. It would appear, according to Lewin's researches, that among workers in petroleum-springs no ill effect is produced; that is, as long as the vapor is inhaled in the open air; but in factories similar symptoms are produced as by ordinary gas. A feeling of exhilaration is first induced, then heaviness in the head, vertigo, loss of consciousness, or anæsthetic sleep. Cyanosis, contracted pupils, and vomiting may occur. Once a fatal result was seen. Chronic bronchitis with anæmia may appear after long exposure to the vapor.

Petroleum applied to the skin may induce moderately serious symptoms. A diffuse inflammation of the cutis may occur in severe cases. When petroleum has been taken internally the symptoms have not always been in proportion to the amount taken. There are two sets of symptoms: (1) gastro-intestinal, the kidneys being also involved; and (2) nervous. In the former case there is

vomiting as well as the local irritation in the mouth and gullet. Diarrhœa, with colic, may supervene. In the cerebral form there is headache, anxiety, vertigo, and the pulse is small and infrequent; collapse may occur. Tetanic convulsions have been seen. A marked petroleum-smell has been noted in the sweat and also in the urine, which may sometimes smell of violets. The urine may also contain albumin and formed elements. Johanessen (Berl. klin. Woch., Apr. 20, 27, '96).

Case of a man who presented some rare hæmorrhagic spots on his body, but especially nasal and gingival hæmorrhages, and hæmorrhagic pleurisy. He died suddenly in a condition of extreme anæmia. At autopsy pleural hæmorrhage was found; there was also myocardiac and endocardiac infarcts, ecchymoses in great abundance on the mucous-membrane of the stomach and intestine, and two hæmorrhagic centres in the left optic layer and in the pons Varolii. Onset of symptoms had been characterized by large subcutaneous ecchymotic patches. Patient had gradually become weakened and been obliged to give up his work, which exposed him for days at a time to benzin-vapors. He had experienced a sort of intoxication, headache, nausea, and general malaise, which had still persisted after he had left the work-room. M. le Noir and M. Claude (Gaz. Heb. de Méd. et de Chir., Nov. 14, '97).

Nine cases of poisoning with benzin, 4 of which were fatal, observed in a factory where a solution of rubber in benzin was used. Symptoms of poisoning were cephalalgia, vertigo, vomiting, throbbing, anæmia, and, above all, cutaneous hæmorrhages, and sometimes hæmorrhages of the gums, the stomach, and the genital organs. There was no icterus. Progress of these symptoms were subacute, and the disease lasted several weeks. In 1 case, which had terminated fatally, microscopical examination of the organs had revealed the existence of fatty degeneration of the heart, the liver, the kidneys, the pelvic organs, and the endothelium of the blood-vessels. From results of experi-

ments on rabbits, it was concluded that the benzol had been the toxic constituent of the benzin in these cases. M. Santesson (Gaz. Heb. de Méd. et de Chir., Aug. 26, '97).

Treatment of Petroleum Poisoning.—

Poisonous symptoms demand the evacuation of the stomach by siphon or emetics, the exhibition of stimulants, and the application of warmth and stimulants to the skin. Artificial respiration may be necessary.

Literature of '96-'97-'98.

Case of child, 21 months old, which drank indefinite amount of benzin. In from half to three-fourths of an hour the child was perfectly unconscious; pupils were dilated to maximum; skin was cold and cyanotic; the breathing was shallow and rapid, and pulse was barely perceptible. Stomach was washed out and milk was thrown into it, injections of ether were given, and a lukewarm bath was administered, with cold affusions. Urine, passed spontaneously, was free from albumin and sugar; temperature was 101.6° F. After a very restless night temperature was 99.5° F., but by evening it had risen to 102.5° F. On following day child was conscious, but in middle of the day the temperature was 104.3° F. On the next day the morning temperature was 99.8° F., and the evening 100.7° F. Rapid recovery then followed. Fever was attributed to acute gastritis. Witthauer (Münch. med. Woch., No. 39, '96).

Therapeutics. — Internally the crude oil has been given in teaspoonful doses to children suffering with whooping-cough and croup. In chronic bronchial disorders it has been found useful, given internally. Crude petroleum was at one time considered a specific against phthisis.

In most cases of influenza benzol used. It is quite well tolerated in the form of an emulsion in lemonade, 4 grains every two hours and a half. William Robertson (Lancet, Nov. 11, '93).

Literature of '96-'97-'98.

Petroleum emulsion commended as useful in consumption. Many patients, consumptive or subject to other wasting diseases, appear to tolerate its use when codliver-oil cannot be tolerated. It probably checks noxious chemical fermentation, and the absorption of such noxious fermented residue of digestion into the blood. At all events, it is clear that petroleum does not irritate the nerves supplying the mucous membrane of the stomach, but doubtless cleanses away foul mucus, and leaves the digestive organs in a more healthy condition to perform their functions naturally. Nutrition is improved, therefore the condition of the lungs improves when weakened and diseased. T. W. Blake (Brit. Med. Jour., Nov. 19, '97).

Hutchinson has found that it possesses no value as a food. It is not absorbed, for after feeding healthy persons with petroleum, he was able in every instance to recover the entire amount from the fæces. It is useful, however, as a protective to the intestinal tract and as a vehicle for carbolic acid and other anti-fermentatives. As a gastro-intestinal protective it may be given in capsules. Petroleum has been given as a vermifuge; 20 to 30 drops three times daily are said to expel tape-worms. In cholera, refined petroleum has been given with success in doses of 10 to 20 drops in mint-water or white wine.

DISORDERS OF RESPIRATORY TRACT.—The inhalation of petroleum-vapor has been recommended in asthma.

Refined petroleum has been successfully used as a local application to dissolve the false membrane in diphtheria. For this purpose, it may also be used as a gargle. Sajous has found it useful in follicular tonsillitis applied with cotton pledget. Petroleum vaporized in the room of patients suffering from diphtheria has been found beneficial. Petrolatum liquidum is useful, in spray, in

cases of acute and chronic rhinitis as an emollient protective.

As LUBRICANT.—Petrolatum liquidum is also a desirable lubricant for catheters, bougies, and other instruments. This preparation alone should be used for this purpose, as vesical calculi have been examined which seemed to have as a nucleus a small portion of petrolatum molle, or petroleum-jelly.

Petrolatum molle is useful as a basis for ointments and as an emollient dressing for sores and skin affections.

EXTERNAL USE.—Externally petroleum is used as a counter-irritant in chronic rheumatism, synovitis, sprains, chilblains, and paralysis, and over the throat and chest in inflammatory disorders of the throat and air-passages. It is used alone or combined with other drugs in chronic and parasitic skin diseases; it has been found beneficial in psoriasis, eczema, seborrhœa, scabies, and in alopecia. It has also been used externally in epithelioma and cancer.

Benzin employed with success in skin diseases of mycotic origin, especially in the ordinary furuncle. It is an excellent parasiticide. F. W. Langdon (Cincinnati Lancet-Clinic, Feb. 7, '91).

Rhigolene is a very volatile product of petroleum. So very rapid is its evaporation that a spray of rhigolene will produce a local temperature of 15° F. It should be kept in tightly-corked bottles and in a cool place.

It is used to produce local anæsthesia for minor surgical operations. It is the liquid employed for use in Paquelin's thermocautery. The use of rhigolene in the vicinity of lights is unsafe. It has also the disadvantage of possessing an unpleasant, garlicky odor.

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PHENACETIN.—Phenacetin (para-acet-phenetidin; acet-phenetidin, or oxy-ethyl-acetanilid) is a coal-tar product, analogous to antipyrine and acetanilid, introduced in 1887 by Hinsberg and Kast as an antipyretic remedy. Phenacetin occurs in colorless, tasteless, inodorous, glistening, scaly crystals melting at 275° F. It is sparingly soluble (1 to 1500) in cold water, but more freely in boiling water (1 to 70) and in alcohol (1 to 16).

Identifications and Tests.—Phenacetin is identified by the production of a deep-red color when chromic acid is added to a cooled and filtered solution of 1 grain in 20 minims of hydrochloric acid diluted with 10 times its volume of water (Ritsert). Its freedom from acetanilid is insured by the isonitrile test, and by providing that a cold, saturated, aqueous solution shall not become turbid on addition of bromine-water. Lastly, sulphuric acid must dissolve it without color, and, heated with free access of air, it burns, leaving no residue. Autenrieth and Hinsberg give a later test: Cover finely-powdered phenacetin with 10 to 12 per cent. nitric acid and heat to boiling; an intense yellow nitro-compound is formed which on cooling separates in yellow needles; antipyrine and acetanilid are unaffected under the same conditions.

If paraphenetidin is present in phenacetin, it will produce irritation of the kidneys, and in consequence may cause grave complications. Reuter gives a test for the presence of this impurity: Melt 40 grains of chloral-hydrate in a water-bath and then add 8 grains of phenacetin, shaking the mixture well. If traces of the impurity be present, the solution is colored immediately violet, then red, and finally blue.

Physiological Action.—Phenacetin,

according to Mahnert, is antagonistic to strychnine in its physiological action, the cardiac and respiratory centres being paralyzed by it. Ott observed that it decreased heat-production without modifying the blood-pressure, its antipyretic action being due, therefore, to its influence upon the nervous system. Cerna and Carter, on the contrary, found that (1) phenacetin, in moderate doses, causes a rise of the arterial pressure by acting upon the heart, and, probably, likewise by a stimulating influence exercised on the vasomotor system; (2) the reduction of the pressure by the drug in large amounts is mainly of cardiac origin; (3) the remedy increases in small doses the force of the heart by direct action; (4) phenacetin increases the pulse-rate chiefly by cardiac stimulation, and, possibly, also, by influencing the cardio-accelerating apparatus; (5) the drug reduces the number of pulsations, especially in large quantities, primarily by stimulating the cardio-inhibitory centres, and, later, by a depressant action upon the heart.

Regarding the action of phenacetin on heat-phenomena, these observers contend that both in septic and albumose fevers it produces a very slight fall of temperature during the first and second hours after its ingestion by the stomach, but that the greatest reduction occurs the third hour after its administration. The fall of temperature results chiefly from a decrease in heat-production, with a slight increase in the heat-dissipation. The increase in dissipation is not so great as with antipyrine. Probably the delayed action of the drug depends on its insolubility.

Poisoning by Phenacetin.—Although phenacetin in ordinary medicinal doses has been considered to be free from ill effects, an editorial writer (*Brit. Med.*

Jour., Dec. 22, '94) states that, nevertheless, unpleasant and profuse diaphoresis may render its habitual use in phthisis and enteric fever undesirable; collapse and exhaustion are not unknown even after median doses, while palpitation and oppression of breathing followed by nausea and vomiting have been likewise observed. Cutaneous eruptions, chiefly urticarious, prevail with a frequency scarcely inferior to antipyrine; and cyanosis of the face, due to changes in the hæmoglobin, may be seen to a similar degree. In short, we may meet all the ill effects of the aromatic group, though the incidence is less.

Three doses, of 7 grains each, of phenacetin, produced in a woman severe præcordial pains, great dyspnoea, lividity of the whole surface of the body, and a state of collapse. She slowly regained consciousness under ammonia and alcoholic stimulation, but could not be about for a week. W. C. Hollopeter (*Med. News*, Sept. 21, '89).

Fatal case of phenacetin poisoning in a boy 17 years old, when 15 grains were to be taken twice daily. After an evening dose vomiting commenced, followed by great weakness and a bluish-gray color of the face and lips. The temperature was 102.2° F., the pupils of medium size, the pulse weak, and the patient complained of headache, vomiting, and diarrhoea. The conjunctivæ were slightly jaundiced. General icterus followed and cyanosis of the lips, ears, hands, and feet. The urine, obtained by catheter, was thick, dark-reddish brown in color, containing masses of almost pure blood. Death followed in two days from universal methæmoglobinæmia, as shown by the necropsy. G. Krönig (*Berl. klin. Woch.*, No. 46, '95).

Treatment of Poisoning by Phenacetin.—The treatment of poisoning by phenacetin is similar to that of poisoning by acetanilid and antipyrine (see ACETANILID and ANTIPYRINE, in volume i).

Therapeutics.—Phenacetin is gener-

ally conceded to be the ideal antipyretic. It is usually given in doses of from 5 to 10 grains; not more than 15 grains should be given. To children 2 to 4 grains may be given according to age. While phenacetin has little or no effect on the temperature in health, its antipyretic effect in febrile disorders is prompt and marked; it is the safest of all the coal-tar products.

Phenacetin is also used as an analgesic, and, although not comparable with morphine in the relief of pain, its anodyne influence is more marked than that of antipyrine or acetanilid. As an analgesic it will be found useful in neuralgias of various kinds, migraine, headache from eye-strain, in the pains of *tabes dorsalis*, and in intercostal neuralgia.

Four cases of syphilitic and other ulcerations, which had proved rebellious to all other treatment, but which yielded rapidly to the local use of phenacetin. The phenacetin, finely powdered, is applied to the ulcerations. It acts as an analgesic, antiseptic, and stimulant. In specific ulceration an appropriate general treatment should be combined with the phenacetin. M. H. Lee (*Memphis Med. Monthly*, Oct., '92).

Phenacetin is useful in relieving the pain of acute rheumatism in doses of 3 to 8 grains given every four hours. A useful combination is 4 grains each of phenacetin and salol given three or four times daily. Phenacetin is also useful in subacute rheumatism, and in lumbar and other muscular pains.

Phenacetin has been much used in the early fever of influenza as an antipyretic.

Literature of '96-'97-'98.

Phenacetin applied locally gives satisfactory results in nasal catarrh. It may be administered in the form of snuff or dissolved in glycerin. J. S. Woodruff (*Jour. of Laryn., Rhin., and Otol.*, June, '97).

Derivatives and Allied Compounds.—

APOLYSIN.—Apolysin is made by replacing one atom of hydrogen in phenacetin by a citric-acid radical. It is much less poisonous than phenacetin and is used as a substitute for it. It occurs as a yellowish-white crystalline powder of a sour taste, less acid than citric acid, and of a characteristic odor. It is soluble in 25 parts of cold water and quite soluble in boiling water. It is freely soluble in alcohol and in glycerin. Its use is contra-indicated during fasting and when there are excessive acid secretions in the stomach (von Nencki and von Jaworski). Hare has tried this drug for painful affections and has been unable to discover any advantage in it over phenacetin; the dose is 5 to 10 grains, 3 times daily.

Clinical observations regarding apolysin led to following conclusions: 1. Apolysin administered to fever patients lowers the temperature and at the same time prevents a series of co-existing symptoms, particularly pain. 2. Given to patients suffering with neuralgia, etc., it diminishes the violence of the pain, allays hyperæsthesia, shortens the duration of the attack, and often completely suppresses the symptoms. 3. Owing to its chemical properties, it acts promptly and regularly, and exercises no injurious effect on the organism. Its employment is contra-indicated during fasting and when there are excessive acid secretions in the stomach. 4. It is more soluble than other drugs in the same group, and consequently more promptly and more easily absorbed. Von Nencki and von Jaworski (*La Presse Méd.*, Oct. 26, '95).

Literature of '96-'97-'98.

Apolysin used in treatment of 46 patients: croupous pneumonia, 2; syphilis, 1; scarlatina, 1; pleuritis, 5; muscular rheumatism, 11; hemicrania, 5; angina follicularis, 1; caries vertebræ, 1; articular rheumatism, 5; neuralgic pains, 10; lumbago, 3; septicæmia, 1; *tabes dorsalis*, 3; typhoid fever, 1 case. Daily dose was from 45 to 105 grains. Con-

clusions are that this is an indifferent pharmaceutical product which possesses no analgesic and but very slight antipyretic and diuretic properties. V. Gez (Wiener klin. Woch., No. 22, '96).

DULCIN.—Dulcin, valzin, paraphenetolcarbamid, or sucrol, is a sweetening agent produced by heating phenetidin with urea. It is said to have 200 times the sweetening power of cane-sugar (Kobert) and not to give rise, on prolonged use, to the dislike following the use of saccharin. The bitter after-taste of saccharin is wanting in dulcin. Squibb mentions its great insolubility as its chief disadvantage. It crystallizes in small, white needles, which are soluble in ether, in 25 parts of alcohol, in 150 parts of boiling water, and in 800 parts of cold water. Dulcin has been used in the place of sugar to sweeten the food of obese and diabetic patients. It may also be used to sweeten bitter preparations. Ewald has given it in daily doses of 24 grains. In moderate amounts it is considered harmless.

Literature of '96-'97-'98.

Dulcin has many advantages over saccharin. It has a pleasant and very sweet taste, and dissolves in 50 parts of boiling water. Personally used in 6 diabetic patients. One patient was under observation for over a year, and during the whole period dulcin was used with no unpleasant effect. It may be employed in doses of 0.025 grain, a quantity which corresponds to 5 grains of sugar. It may also be added at times to cooked articles of diet, such as sauces, jellies, fish, etc. S. Sterling (Münch. med. Woch., Dec. 16, '96).

IODOPHENIN.—Iodophenin, or iodo-phenacetin, is a reaction-product of phenacetin in hydrochloric acid and iodine in potassium iodide. It contains 25 per cent. iodine. It occurs in brownish-black crystals, having an iodine odor and a burning taste. It is soluble in al-

cohol and in water with the liberation of iodine. It is antiseptic in action and in solution acts like iodine solution. It is used externally like iodine, and as a substitute for iodoform.

Iodophenin employed in the treatment of purulent and infectious wounds and it was found that it equals corrosive sublimate and iodoform; however, since iodine is so easily liberated, the direct application of it is contra-indicated in fresh wounds. Ichorous ulcers of the leg became dry and aseptic after the second dressing of iodophenin in powder or glycerinated emulsion on cotton, and iodoform then accomplished a prompt cure.*

As it exerts a slightly-caustic action on the granulations, after the wounds have become clean under its use it should be replaced by iodoform. Iodophenin is also serviceable after the extirpation of ganglia as well as after major surgical operations (resections, etc.) to prevent decomposition of secretions in contact with bandages. It is preferable not to sprinkle the wounds directly, but to use it between the layers of the cotton dressing, which may be left in place for two to three weeks without becoming putrid, even in cases of very abundant secretion from non-aseptic wounds. Schüler (Wiener med. Presse, Jan. 14, '94).

LACTOPHENIN.—Lactophenin, or lactyl-phenetidin, is a derivative of phenetidin with lactic acid. It occurs as a white powder, sparingly soluble in water. Lactophenin has antipyretic, antineuralgic, analgesic, and hypnotic powers. In some cases it gives rise to diaphoresis and slight vertigo; sometimes it causes a sense of heat and weight in the epigastrium, but it does not continue long. Cases have been reported in which a rash appeared after the administration of the drug. Lactophenin has been given in pneumonia, influenza, erysipelas, scarlatina, acute tuberculosis accompanied by fever, and in septicæmia. Eight to 15 grains produces a decided,

but gradual, fall of temperature, which persists for several hours. Lactophenin quiets delirium. Roth found it beneficial in acute rheumatism. It has been used with success in some cases of chorea and in the pains of locomotor ataxia.

Lactophenin acts precisely like phenacetin when both are given in $9\frac{1}{4}$ -grain doses, but $15\frac{1}{2}$ grains of lactophenin produce a decidedly hypnotic effect. Landowski (Lancet, Apr. 21, '94).

It is questioned whether the remarkable remissions in temperature produced by lactophenin are not in reality due to a state of collapse. F. Kolbl (Wiener med. Presse, Oct. 20, '95).

Catarrhal jaundice following the use of lactophenin and apparently due to the drug as seen in three instances. In each case the drug was being administered for neuralgia and a dose of $15\frac{1}{2}$ grains was being taken four times *per diem*, the length of time before the jaundice appeared varying from fourteen to twenty-one days from the commencement of the treatment. The jaundice appeared to be of the ordinary catarrhal type, the stools being white and the urine bilious. Strauss (Therap. Monats., Sept., '95).

METHACETIN. — Methacetin, para-acetanisidin, or para-oxy-methyl-acetanilid, is a homologue of phenacetin. This compound differs from phenacetin only in containing a methyl in place of an ethyl group. It occurs in a white micro-crystalline powder of a feeble bitter taste, and is soluble in alcohol, chloroform, dilute acids and alkalies and slightly soluble in water (1 to 300). It is an antipyretic, antineuralgic, antiseptic, and antifermentative. It has been used in pneumonia, typhoid fever, phthisis, scarlet fever, rheumatism, and various forms of neuralgia, in doses of 4 to 8 grains for an adult and 2 to 5 grains for children. In phthisis its action is not favorable, as it gives rise to copious diaphoresis.

Methacetin, employed in a series of observations in health and disease, was found to produce in all instances a lowering of the temperature, this being its most important action. In disease the effects were more remarkable than in health. The affections treated were pulmonary tuberculosis, typhoid fever, acute articular rheumatism, and pleurisy, and in these the diminution of temperature under the influence of the drug was more or less pronounced, according to the case. Pescarolo (Gaz. degli Osp., Nov. 27, '89).

THYMACETIN. — Thymacetin is a derivative of thymol, and is closely allied to phenacetin. It bears the same relation to thymol that phenacetin does to phenol. It occurs as a white, crystalline powder, soluble in alcohol and ether, and slightly soluble in water. It is an analgesic, hypnotic, and antiseptic, and has been used in headache, neuralgia, paralysis, insomnia, and delirium, in doses of from 5 to 15 grains, three or four times daily, best given in capsules or wafers.

C. SUMNER WITHERSTONE,
Philadelphia.

PHENIC, OR CARBOLIC, ACID AND DERIVATIVES.

Phenic or phenylic acid, carbolie acid (acidum carbolieum, U. S. P.), phenol, phenyl-hydrate, phenylic alcohol, or coal-tar creasote obtained by fractional distillation, at 338° to 446° F. Pure carbolie acid (acidum carbolieum, U. S. P.) occurs in long, colorless needles, melting at 95° F. and having a characteristic odor and, when highly diluted, a sweetish taste. Carbolie acid deliquesces in moist air and becomes red on exposure to the light. It is freely soluble in alcohol, ether, chloroform, and glycerin, and slightly soluble in water. The pharmacopœia recognizes a crude acid (acidum carbolieum crudum, U. S. P.), which is a mixture chiefly of cresol and phenol and

occurs as a dark, oily liquid, having a strong tar odor, and is partly soluble in water. This crude acid is used chiefly for disinfecting purposes either in solution (1 in 50 to 200) or mixed with chloride of lime, slaked lime, etc.; the crude acid is not adapted for wounds. Between these official preparations there are others of various grades of purity. Five grades, known by numbers, are made. The pure acid in colorless crystals is known as number one, and is alone fit for internal use. Number two is also crystalline. Numbers three, four, and five are impure, containing other ingredients of coal-tar, especially cresol.

The crystals of pure carbolic acid may be liquefied by the addition of 5 per cent. of water, a clear solution resulting; the further addition of water produces turbidity until the proportions are reversed (1 to 20), when it becomes permanently clear and remains unaffected by further dilution.

Preparations and Doses.—*Acidum carbolicum*, U. S. P. (pure crystals), 1 to 3 grains.

Acidum carbolicum crudum, U. S. P. (impure, 90 per cent.), for disinfection.

Glyceritum acidi carbolici, U. S. P. (glycerite, 20 per cent.), 2 to 5 minims.

Unguentum acidi carbolici, U. S. P. (ointment, 5 per cent. carbolic acid).

Physiological Action.—Locally, carbolic acid is an energetic caustic, in dilute solution an irritant. In concentrated form, when brought in contact with the tissues, it causes rapid disorganization of the part and the formation of a hard mass, which does not disappear for some time. If one of the extremities be immersed in a comparatively weak solution of the drug, a contraction of the capillaries and consequent pallor of the skin results, with a certain amount of local anaesthesia—a stronger solution

producing some preliminary burning. Upon the mucous membrane the acid causes, first, a sensation of burning pain, then anaesthesia, leaving a white eschar (Pouchet).

When administered internally in toxic doses it gives rise to convulsions of spinal origin, to which are added at first increased reflex activity. This being followed by paralysis, it is evident the spinal centres are first stimulated, then depressed. The nerves and muscles, as shown by Salkowski and Hoppe-Seyler, are not distinctly paralyzed however, since they respond actively to galvanic stimulation (Wood). The arterial pressure is reduced and the heart depressed. Gies has shown that carbolic acid paralyzes the vasomotor centre in the medulla before affecting the heart. The condition of the blood induced in animals is one of oligocythæmia rather than oligochromæmia, as the reduction of blood-corpuscles is not accompanied by any alteration in the percentage of hæmoglobin (W. J. Wilkinson). Respiration is at first greatly increased in frequency, owing, mainly, to a stimulating influence exerted upon the respiratory centres during the first stages and in part to stimulation of the peripheral vagi (Salkowski). As to the effects on temperature, H. C. Wood concludes from the experiments of H. A. Hare and E. Erls that carbolic acid may affect the thermogenic functions in two ways: first, by diminishing the production of heat; second, by increasing the dissipation of heat.

Carbolic acid coagulates albumin, and in sufficiently strong solution is poisonous to all forms of life, its main use in practice depending upon its ability to destroy micro-organisms rather than as a stimulant.

Poisoning by Phenic (Carbolic) Acid.—Carbolic acid is a most deadly poison

and acts rapidly. Six or seven drops have caused the most dangerous symptoms. Death may be expected to follow almost immediately after taking any large quantity. Death has taken place within ten minutes after swallowing about one ounce of carbolic acid, although life may be protracted two or three days. If a large dose be swallowed one may drop dead before he can get more than a few feet from the spot where he stood or he may live a few hours. Sudden death is due to failure of respiration. If death is delayed, symptoms of violent gastro-enteritis ensue. The symptoms of poisoning are vertigo and intoxication, accompanied with vomiting of frothy mucus, and an intense burning pain in the mouth, œsophagus, and stomach. The pupils are contracted, the pulse rapid and intermittent, and coma, collapse, or convulsions ensue. The skin is covered with a clammy sweat, the features are pinched and anxious, and the pulse becomes very thready and almost imperceptible, as a rule. White eschars are noticed about the mouth, if the pure acid has been taken, or blackish, if the impure drug has been used. The odor is apt to hang about the person or clothes. The urine is frequently suppressed, but, if passed or withdrawn by catheter, is dark colored and smoky. Convulsions or coma often close the scene. A very common symptom (Hare) is hoarseness of the voice, due to an effect on the larynx after the drug is absorbed, and not from its local influence. Cases are on record where carbolic-acid poisoning has been due to its absorption from surgical dressings. In these cases a darkened, smoky hue of the urine, with slight nervous unrest or cerebral disturbances, is present. Pain in the lumbar region is another indication of this condition, and

should suggest the removal of the dressings.

Four cases of gangrenous fingers lately noted from the use of carbolic acid for insignificant injuries. It is a dangerous drug for the laity to have, and should be used only by a surgeon. Th. Billroth (*Weekly Med. Review*, Oct. 5, '89).

Equal parts of carbolic acid and sweet oil, applied to a burn on the arm of a child 7 months old, put it into a stupor in two hours. Despite every effort of the physician, the child died in convulsions thirty hours after the application. S. T. Richardson (*N. Y. Med. Jour.*, Nov. 30, '89).

Prolonged application of carbolic acid is injurious to the skin, and even to the bone, as it hinders nutrition and prevents removal of harmful substances from the parts treated. Carbolic-acid water should not be used externally, except under the greatest precautions. A. Frankenger (Inaug. Dissert., '91).

Severe case of acute poisoning from use of vaginal injections of a carbolic-acid solution, the patient, who was very anæmic, being restored with difficulty in seven hours. For five days the urine contained traces of carbolic acid. W. Sekowski (*Gaz. Lekarska*, No. 42, '94).

Literature of '96-'97-'98.

In the United Kingdom in the period 1861-65 the suicides by carbolic acid were 0.00 per cent. of all suicides with poisons; in 1866-70 they were 1.00 per cent.; in 1871-75, 5.82 per cent.; in 1876-80, 7.93 per cent.; in 1881-85, 15.37 per cent.; in 1886-90, 15.49 per cent.; and in 1890-94 (four years), 28.01 per cent., thus showing that the sale of carbolic acid should be restricted as is that of the recognized poisonous substances. A. E. Harris (*Lancet*, Nov. 28, '96).

In five autopsies of carbolic-acid poisoning noted the tongue, gums, and, in fact, the whole mouth were colored white. This discoloration also affected the whole alimentary tract. The mucosa of the œsophagus was smooth and white and could be easily stripped from the muscularis. The kidneys showed, in 1 case, principally interstitial changes;

in the others the parenchyma of the organ was mainly involved. In 3 of the cases the lungs were congested and œdematous. The remaining internal organs presented no lesion which could be ascribed to the acid. William Moser (Brooklyn Med. Jour., Jan., '96).

One-third of the males and very nearly one-half of the females who poisoned themselves in 1895 did so with carbolic acid. These figures speak eloquently in favor of some restriction in the sale of carbolic acid to the general public. The time has come when a poison which accounts for 244 suicidal deaths out of a total of 580 caused by poison in one year, should be placed out of reach of the general public. Mann (Med. Chronicle, May, '97).

Physicians cannot too often caution the public against the prolonged topical application of carbolic acid even in the weakest solutions. Among 20,417 patients treated in the surgical service of the hospital belonging to the Allgemeine Arbeiterkrankenkasse, carbolic-acid gangrene was observed in 26 cases—in 12 after the topical employment of weak solutions and in 14 as the result of the use of the concentrated acid. In nearly every instance the drug was used without medical advice, in the form of a solution kept applied continuously. J. Levai (Pester med.-Chir. Presse, Nos. 8, 10, 11, and 12, '97).

Cases of gangrene brought about by the use of carbolic-acid solutions are generally produced by the continued use of moist dressings containing the official 3-per-cent. solution of carbolic acid and applied as an antiseptic dressing for minor wounds of the extremities. The anæsthetic action of the carbolic acid makes the patient unmindful of the insidious action of the drug. The danger of the solution, even a 1 per cent., is very great if the use is prolonged, and carbolic acid should never be used as a moist dressing. Czerny (Münch. med. Woch., Apr. 20, '97).

From Levai's data and from observations made on out-patients of the Tübingen clinic, it is estimated that one case of carbolic-acid gangrene occurs in every thousand surgical patients. In

literature are found 43 examples sufficiently described; in 30 of them the strength of the solution was from 1 to 5 per cent. The thromboses found are not the cause of the gangrene, but only an accompaniment. As compared with that due to the other caustics mentioned, there is nothing specified in the gangrene induced by carbolic acid; it acts by giving rise to excessive transudation into the subcutaneous cellular tissue, and so choking the circulation, especially in the fingers. The most effective prophylactic would be to restrict the sale of carbolic acid. Honsell (Beit. zur klin. Chir., xix, 9; Centralb. f. Chir., Mar. 5, '98).

Treatment of Poisoning by Phenic (Carbolic) Acid.—The soluble sulphates are chemical antidotes to carbolic acid, their combination forming insoluble sulphocarbonates. Epsom, or Glauber's, salts in solution readily follow the acid into the vessels and tissues of the body and combine at once with it. They should, therefore, be given even if hours have elapsed since the poison was taken. Liquor calcis saccharatus, or syrup of lime, is also a useful antidote. Warm mucilaginous drinks may be given to soothe and protect the inflamed digestive tract. Oils should not be given, as they dissolve the acid and favor absorption. Collapse requires hypodermic injections of digitalin and strychnine, and friction and hot applications to the extremities. Failing respiration calls for atropine injections; pain may be relieved by injections of morphine and counter-irritation over the abdomen. Emetics will not act on account of the condition of the stomach; the stomach-pump is generally contra-indicated on account of the lesions along the œsophagus and in the stomach. If the patient survive, small doses of the soluble sulphates may be given at stated intervals for several days, to counteract any acid that may have been absorbed.

Literature of '96-'97-'98-'99.

Case of a girl, 18 years old, suffering from carbolic-acid poisoning. When admitted to the hospital she was quite unconscious, cyanosed, and nearly pulseless. The lips and the tongue were discolored, and the breath had a slight carbolic-acid odor. Hypodermic injection of strychnine ($\frac{1}{50}$ grain) was given. A soft stomach-tube was passed and the stomach washed out with equal parts of vinegar and water, this being followed with about 6 pints of warm water; 5 ounces of milk and an ounce of brandy were then given. She was put into bed and kept warm. She gradually regained consciousness, and a few hours afterward was able to speak. She was fed on Benger's food, milk, and soda-water for the next three days. Carboluria was present for two days. Conclusion is that vinegar should be given a fair trial in carbolic-acid poisoning. A. Paget (Indian Med. Rec., Dec. 1, '97).

In the treatment of poisoning by carbolic acid, 30 to 60 minims of sulphuric ether should be injected immediately by hypodermic syringe. A rectal injection of 2 ounces of sulphate of sodium in 3 pints of filtered water is then given, the bowel being irrigated as high as possible after the manner of Cantani.

By the mouth or by means of an œsophageal tube 1 ounce of sulphate of magnesia in a quart of hot water is to be administered, as this will form an innocuous sulphocarbolate with the carbolic acid. It may be necessary, also, to bleed the patient and then to perform intravenous transfusion or hypodermoclysis, the injection consisting of 300 grains of chloride of sodium in a quart of boiled distilled water. Morphine and heat should be applied to the extremities, and, if the fluid which has been injected into the rectum to wash it out has passed away, a small injection of strong black coffee should be given as a respiratory stimulant. Tea and hot punch may also be administered. Landouzy (La Presse Méd., Mar. 19, '98).

Case of woman who swallowed 7 drachms of ordinary commercial carbolic acid. She was comatose and collapsed and death seemed imminent. The stom-

ach was washed out with water containing sodium sulphate; 8 ounces of blood were removed from the saphenous vein and 4 pints of a normal saline solution at a temperature of 100° F. were injected into the vein. Atropine sulphate, $\frac{1}{50}$ grain, was administered hypodermically, and half a pint of milk, beaten up with 2 eggs and 1 minim of croton-oil, was introduced through the stomach-tube. Recovery was eventually complete. T. Oliver (Lancet, Mar. 19, '98).

Case of woman, who had swallowed over an ounce of 95-per-cent. carbolic acid. A short time after her swallowing of the acid hypodermic of sulphate of sodium was given. Then the stomach was washed with a 35-per-cent. solution of alcohol, about 2 quarts of the alcohol solution being used. The patient entirely recovered, although her face was badly burned with the acid and the mucous membrane of the mouth seemed entirely destroyed. This is believed to be the first time that alcohol has been used internally for the burns of carbolic acid. J. Drysdale Buchanan (Med. Rec., Aug. 12, '99).

Case of carbolic-acid poisoning from use of vaginal douche. Large eschars formed wherever solution had touched. Syringing with warm solution of sodium sulphate, a drachm to the pint, produced relief in ten minutes, absolute freedom from pain in a half-hour; saturated cloths were kept on the blistered parts all night and complete recovery was obtained within twenty-four hours. Carbolic acid, so called, is not really an acid; and hence alkaline solutions are of no avail. Sodium sulphate forms with the carbolic acid sodium sulphocarbolate, which is soothing in effect and prevents further damage. B. Weiss (N. Y. Med. Jour., Jan. 7, '99).

Therapeutics. — ORAL DISORDERS. —

Solutions of carbolic acid have been recommended in stomatitis, a spray of 1 grain to the ounce of water, or a mouth-wash or gargle containing 2 to 5 grains to the ounce of water may be used. Offensive breath may be sweetened by the use of a 5-per-cent. spray.

The cavity of a carious tooth may be packed with a pledget of absorbent cotton dipped lightly in a concentrated solution of carbolic acid to relieve the pain. In diphtheria and fœtid sore throat a 2- to 5-per-cent. solution may be used with brush or atomizer.

GASTRO-INTESTINAL DISORDERS.—In nervous vomiting or that due to gastric irritation $\frac{1}{2}$ - to 2-drop doses will afford relief by the depressant action of the acid on the nerves of the stomach. Fermentative diarrhœa is well treated by giving 2 to 4 drops of carbolic acid combined with 10 to 20 grains of bismuth in powder or capsule. Cholera infantum and cholera morbus are amenable to similar treatment if fermentation is present.

Vomiting after ether can be stopped by giving $\frac{1}{4}$ drop of carbolic acid every hour for a few hours. W. W. Keen (College and Clin. Rec., Nov., '94).

RESPIRATORY DISORDERS.—Weak solutions of carbolic acid are of value in chronic and atrophic rhinitis, coryza, hay fever, and influenza; the solution (2 to 5 grains to the ounce) is best used in spray. The familiar "Dobell's solution," used for cleansing the nares previous to making applications, contains a small amount of carbolic acid.

A solution (5 to 15 drops of acid to the ounce of water) inhaled by means of very fine spray is beneficial in gangrene of the lung and in pulmonary tuberculosis; it controls the cough and relieves the tickling in the throat. For this and other uses about the respiratory passages, beech-wood creasote is to be preferred.

FEVERS AND SEPTIC DISORDERS.—A favorite treatment for enteric fever with some is a combination of 1 part of carbolic acid and 2 parts of tincture of iodine; 2 or 3 drops are given in mint-water every three or four hours. R. H.

Quill uses carbolic acid and spirit of chloroform (3 to 10). Charteris advises $2\frac{1}{2}$ grains, absorbed by some inert powder, in pill coated with keratin.

Literature of '96-'97-'98.

Results of carbolic-acid treatment in typhoid wards of General Hospital, Nowshera, India: 79 cases were treated, with 11 deaths, giving the average mortality of 13.9 per cent. On arrival of patients, after being washed and placed in bed, carbolic acid was prescribed, four doses of 4 minims each, well diluted with iced water, being ordered in the twenty-four hours. This was supplemented during the night, if the skin was hot and burning and the temperature running high, by two full doses of ordinary diaphoretic mixture. Formula generally used for carbolic acid was Calvert's pure carbolic acid, 4 minims; spirit of chloroform, 15 minims; compound tincture of cardamoms, 20 minims; with syrup and water to 1 fluidounce. This mixture was kept in the ice-box. Without any exception it was well tolerated by the stomach and caused no unpleasant symptoms. Complications, however, were frequent and severe.

The following favorable signs appeared after the administration of the acid:—

1. A rapid cleaning of the tongue with the abolition of the characteristic unpleasant typhoid odor from the breath.
2. A sustained and remarkable lowering of the febrile temperature, with a well-marked morning remission in many cases.
3. Marked improvement in the unpleasant odor from the stools, which in a few days became practically deodorized.
4. Tympanites, diarrhœa, and delirium were rarely excessive and easily under control.
5. A most favorable convalescence with a sound recovery. R. C. Thacker (Brit. Med. Jour., Sept. 24, '98).

Septic disorders—as variola, septicæmia, puerperal fever, etc.—have been

successfully treated with the sulphocarbolates; the sulphocarbolate of zinc may be given in doses of 2 or 3 grains four or five times daily.

Account of excellent results obtained in employment of carbolic acid internally in the treatment of small-pox in the Hospital Militar de Zaragoza is as follows: (1) the drug diminishes the temperature, which ascends again when the treatment is suspended; (2) it diminishes the number of cardiac pulsations, at the same time increasing their force; (3) it lessens the extension and duration of the eruption, checks the production of pus, and shortens the period of suppuration, especially when it is administered at the beginning of the disease; (4) in many cases the pustules of the confluent form become shriveled up and dry in a few days under the influence of the remedy; (5) in advanced cases it does not greatly modify the eruption, but will, nevertheless, influence favorably the fever and the general state of the patient; (6) the liability of complications is diminished. The results obtained seem to indicate that in the treatment of small-pox carbolic acid has as much value as quinine has for intermittent fever. The number of cases observed was 44,—18 of the discrete and 26 of the confluent form.

The mortality was 0.5 per cent. The acid was given in doses of from 15½ to 31 grains in the course of the twenty-four hours, in solutions of the strength of ½ per cent. Manuel Case y Abril (*Revista médico-farm. de Aragón*, Nov. 16, '91).

CUTANEOUS DISORDERS.—In parasitic skin diseases carbolic acid may be applied in ½- to 2-per-cent. solution: Scabies, favus, tinea tonsurans, tinea circinata, pityriasis versicolor, etc. In most of these diseases other remedies are preferable. In subacute eczema when there is a great amount of weeping and itching, a cerate of 10 grains of the acid to 1 ounce of simple cerate has been recommended.

Literature of '96-'97-'98.

Case of leucoderma treated by carbolic acid. There were numerous white patches, surrounded by zones of brown pigmentation in the groins, on the abdomen, and the legs. Over the sacrum, the nape of the neck, and in the armpits were patches of brown discoloration only. Patches on nape of neck and sacrum were painted with pure phenol. Skin resumed its normal pink color after three weeks. Savill (*Brit. Jour. of Derm.*, Mar., '98).

A good dressing for burns consists of carbolic acid and carron-oil (4 grains of acid to each ounce of oil). B. F. Gardner applies the pure acid to burns and then cleanses with sterilized water.

Erysipelas has been treated by subcutaneous injections of a 2-per-cent. solution of carbolic acid. These have also been used in actinomycosis.

Good results obtained from carbolic acid especially in erysipelas, from the subcutaneous injection of a solution containing equal parts of glycerin and carbolic acid. A dose of ⅞ grain is employed and has been found satisfactory as an analgesic and antithermic. Faivre (*La Sem. Méd.*, Aug. 17, '95).

An ointment containing carbolic acid and camphor has been used to mitigate the severe pruritus accompanying variola and to prevent pitting.

Literature of '96-'97-'98.

In two cases of variola, as soon as the papules developed into vesicles the surface was scrubbed with soap and water, followed by solution of hydrogen dioxide. The vesicles were then opened, the fluid allowed to escape, and the cavity touched with pure carbolic acid; the surface was again washed with solution of hydrogen dioxide, oiled, and covered with cloths wrung out of carbolized water. No pitting resulted. F. S. Purmann (*Med. Rec.*, Sept. 5, '96).

In many pruritic diseases, as papular

eczema, psoriasis, lichen, and urticaria, or nettle-rash, J. V. Shoemaker advises: Carbolic acid, 5 to 10 drops; sublimed sulphur, $\frac{1}{2}$ drachm; camphor, 10 grains; zinc ointment, 1 ounce. This is to be applied frequently to the irritable surface.

Lotions containing carbolic acid allay the itching which accompanies jaundice. Hare recommends: Carbolic acid, 10 grains; olive-oil, 4 drachms. This to be applied frequently.

SURGICAL DISORDERS.—Carbolic-acid solution (1 to 20) has been used in surgery as an antiseptic lotion and also to keep instruments in while operating (corrosive sublimate and other antiseptics have almost entirely replaced it for the latter purpose).

For the dressing of wounds, carbolic acid has been used in the form of lotion, carbolized oil, gauze, and spray. As a local anæsthetic for minor operations (removing toe-nail, opening felon, incising carbuncle, etc.), it may be used by soaking the part for ten minutes in a strong solution, and afterward applying the pure acid on a brush to the line of incision.

Pure carbolic acid is an excellent application to carbuncles or malignant pustule after incision and curetting; it acts as an antiseptic and anæsthetic as well.

Four injections of a 2- to 3-per-cent. solution into the centre of a boil will usually bring about resolution. Leux (*Australian Med. Jour.*, Sept. 15, '89).

For urethral caruncle, injections of 20 drops of a mixture of equal parts of phenol and glycerol combined with 80 drops of water successfully employed. Webster (*Mass. Med. Jour.*, Mar., '94).

Camphorated phenol diluted with 50 per cent. of cotton-seed oil used with excellent results as a dressing for a severe case of ulcerating epithelioma of the leg. Toms (*Internat. Med. Annual*, '95).

Literature of '96-'97-'98.

Case of lupus erythematosus cured by continued use of undiluted carbolic acid, which was painted over the edges of the patches once or twice a week, and boric-acid ointment (20 grains to the ounce) applied daily, and especially after applying the acid. Minim doses of Pearson's solution of arsenic were also given with nux vomica and tincture of orange-peel. Carbolic acid is the safest and most effectual form of caustic to use for patients with forms of lupus, etc., who are not under close observation. J. Hutchinson (*Arch. of Surg.*, Jan., '98).

S. Sherwell, of Brooklyn, treats nævi by tattooing them with needles dipped into a 50-per-cent. solution of the acid, afterward cleansing the surface with alcohol, and finally applying a layer of collodion. The results are said to be excellent, little or no scarring being left.

Non-suppurating enlarged glands may be treated by parenchymatous injections of 5 to 10 minims of a 2-per-cent. solution of carbolic acid. Buboës may be similarly injected with 10 minims of solution (8 grains to 1 ounce), first numbing the skin by an ether-spray. This treatment is also good in chronic synovitis (repeated every three days), and for boils and carbuncles if used early enough to abort the trouble.

For the cure of hydrocele, R. J. Levis advised injecting into the tunica vaginalis 15 to 20 minims of pure acid, after withdrawing the fluid.

Tetanus has been successfully treated by hypodermic injections of a 1-per-cent. solution of the acid, conjoined with warm baths and enemata containing chloral and potassium bromide.

Literature of '96-'97-'98.

By means of a series of subcutaneous injections of carbolic acid, hopeless case of tetanus was successfully treated. Patient was a man who had gunshot wound in his left leg, which was fol-

lowed ten days later by tetanus, commencing in the muscles of the lower jaw and going on to general spasmodic contractions. After the tetanus had lasted for ten days subcutaneous injections of carbolic acid of the strength of 2 per cent. were tried, 12 drops being injected every three hours. After two days of this treatment a marked improvement manifested itself. Injections were continued until twenty-eight had been given, and a few days later the patient was discharged completely recovered. Osherovski (Lancet; Indian Lancet, Nov. 16, '97).

DISINFECTANT.—As a disinfectant carbolic acid is only of moderate effectiveness; although a 2-per-cent. solution will kill most spores and germs, many resist, and even a 5-per-cent. solution requires more than twenty-four hours to kill the spores of anthrax. In all cases of disinfection by carbolic acid an exposure *by contact* of some duration is necessary. As an adjunct to other disinfection, the walls and floors of infected rooms may be scrubbed with a solution of carbolic acid, not weaker than 2 per cent. For the disinfection of wounds carbolic acid has been replaced by other remedies, which are as efficient and less harmful, as a deodorized carbolic acid is practically inert.

Study of relative value of disinfectants gives following results: 1. Alcohol in the absence of water neutralizes all bactericidal power on the part of mercuric chloride or phenol with regard to anthrax spores. The bactericidal action is not exercised until the dilution of the alcohol with water is greater than 2 per cent. in the case of 1 to 1000 sublimate solution, or than 70 per cent. in the case of phenol. 2. Glycerol interferes with the action of a 2 to 1000 solution of mercuric chloride if the proportion of water be less than 40 per cent. In the case of phenol it is still more manifest. 3. Phenol and lysol dissolved in olive-oil has no disinfecting action. Lenti (Ann.

dell' Inst. d'Igiene sperm. della R. Univ. di Roma, vol. iii, fasc. 4).

Derivatives and Allied Compounds.—

ASEPTOL, OR SOZOLIC ACID.—This is a 33 $\frac{1}{3}$ -per-cent. solution of ortho-phenol-sulphonic acid. It occurs as a clear, yellowish-brown liquid; has the odor of carbolic acid; is soluble in alcohol, glycerin, and in all proportions in water; and possesses antiseptic properties. It is used as a disinfectant. It is claimed that it is free from all toxic effects, yet more efficient than carbolic acid. It has been used externally in diseases of the bladder, eye, and skin, and in diphtheria, laryngitis, gingivitis, etc., in solutions of from 1 to 10 per cent. It should be kept from the light.

BROMPHENOL.—This is a fluid analogous to chlorphenol, bromine taking the place of chlorine. It has a purple color and has less of the carbolic odor than chlorphenol. Like chlorphenol, it is freely soluble in water, alcohol, and alkaline fluids. Like chlorphenol, in the form of a 2-per-cent. ointment it has given excellent results in erysipelas. (I. Tschourilow.)

BROMOL, TRIBROMOPHENOL, OR TRIBROMPHENOL.—This is obtained by the action between an aqueous solution of carbolic acid and bromine-water. It occurs in white crystals, of a disagreeable bromine odor, and has a sweet, astringent taste. It is insoluble in water, but soluble in alcohol, glycerin, ether, chloroform, and oils. It has been used in daily doses of 3 to 7 $\frac{1}{2}$ grains in cholera, typhoid fever, etc., and locally to purulent wounds in oily solution (1 to 30) or in ointment (1 to 8), and in diphtheria in 4-per-cent. solution in glycerin.

Bromol has given good results in diphtheria, in a glycerin solution of the strength of 1 in 25, locally applied. It may be also used in cholera infantum,

in doses of from $\frac{1}{12}$ to $\frac{4}{17}$ grain. Rade-maker (*Lancet*, Oct. 10, '91).

CHLORPHENOL.—This is a liquid obtained by the action of chlorine-gas upon carbolic acid. It is a mixture of chlorophenols, and is a dense volatile fluid of pleasant odor. It has been used in the treatment of tuberculosis, chronic bronchitis, bronchorrhœa and gangrene of the lung, ozæna, and laryngitis (Passerini), by inhalation, the daily dose being from 20 to 30 drops. It has also been used locally on ulcers and in purulent otitis and abscess of the antrum of Highmore.

TRICHLORPHENOL, OR TRICHLOROPHENOL.—This is obtained from phenol by the action of chlorine. It occurs in white needles, soluble in alcohol and in ether, and slightly soluble in water. It is used locally in the treatment of diphtheritic ulcers, erysipelas, chancres, etc., in the form of a 5-per-cent. solution or ointment.

DIAPHTHERIN, OR OXYQUINASEPTOL.—This is a yellow, crystalline powder, soluble in water and dilute alcohol, and is a non-poisonous antiseptic. It is used in $\frac{1}{2}$ - to 2-per-cent. solutions for dressing wounds, ulcers, burns, etc., in external and median otitis and in eczema of the ear and nose. In solution it does not stain the hands, but it blackens steel instruments. This discoloration can be easily removed.

Diaphtherin possesses decided germicidal powers. A solution of the strength of 0.3 per cent. and one of 0.1 per cent. were sufficient to kill the *staphylococcus pyogenes aureus* in the course of fifteen minutes and forty-five minutes, respectively. Diaphtherin occurs in powdered form, very soluble in water. Solutions of 1-per-cent. strength have been employed with advantage in the treatment of wounds. It may also be used as a dusting-powder. The only disadvantage noticed so far is the staining of steel

instruments occasioned by the drug. Kronacher (*Münch. med. Woch.*, May 10, '92).

Diaphtherin as a germicide is much better than phenol and lysol in the form of a 2- or 3-per-cent. solution. Instruments that are not nickled are blackened by its use. It has an advantage over carbolic acid in that it is easily transported, either in the form of powder or tablets. It is chemically clean and its action easily controlled. It is not poisonous. A watery solution is perfectly clear, and there is no evaporation. Its use in surgery is recommended in strengths of $\frac{1}{2}$ - to 2-per-cent. solutions. It is a most excellent dressing in cases of burns. There is never any irritation about the edges of wounds after its use, but occasionally patients complain of a slight burning sensation. The solutions do not affect the hands of the operator as do sublimate and carbolic solutions. Its greatest application is to be found in the treatment of nasal and aural troubles. Lembach and Schleicher (*Corres. f. Schweizer Aerzte*, Nov. 1, '92).

DIAPHTHOL, OR QUINASEPTOL.—This occurs in yellowish-white crystals, soluble in 35 parts of boiling water, and slightly soluble in cold water. It has antiseptic and antifermentative properties and is used in solution to disinfect the urinary tract. It prevents the decomposition of urine better than salol. It is slightly toxic, but does not give rise to gastric or intestinal irritation. Diaphthol is eliminated unchanged by the kidneys.

PHENOSALYL.—This is a mixture of carbolic acid, 90 parts; salicylic acid, 10 parts; lactic acid, 20 parts; and menthol, 1 part, mixed with heat. It has been used externally in solution, in conjunctivitis (in 0.2 to 0.4 per cent.), in eczema (in 1 per cent.), and in purulent cystitis (in 2 per cent.).

Phenosalyl possesses antiseptic powers superior to the antiseptics usually employed, with the exception of corrosive sublimate. A solution of 1 per cent. suffices to kill the most resisting mi-

crobes in one minute. It has the great advantage of being non-toxic, experiments showing it to be four times less so than carbolic acid and a hundred times less than corrosive sublimate.

Clinical experiments with the drug were made at the Hôtel-Dieu, in Paris, in the service of Cornil, upon more than one hundred patients, mostly affected with genito-urinary troubles, as endometritis, erosions of the cervix, vaginitis, and urethritis. In every case, even inveterate ones, its use was followed by rapid recovery. In several cases of puerperal infection it caused the fever and other symptoms rapidly to disappear. For surgical use, injections, irrigations, etc., phenosalyl is employed in aqueous solutions of from $\frac{1}{2}$ to 1 per cent. This does not injure the instruments nor irritate the skin. It may easily be used for antiseptic gauze and cotton, and for the preservation of silk and hair, sponges, etc. Duloir (Thèse de la Faculté de Paris, '93).

SAPROL.—This is a mixture of coal-tar constituents, proposed as a cheap disinfectant. It occurs as a dark-brown, oily fluid. When added to water it floats. In 1-per-cent. solution it is well adapted for the disinfection of dejecta in barracks, prisons, and schools.

Of all disinfectants advocated for rendering infected stools and cess-pools innocuous, saprol most nearly answers all requirements. It forms no inefficacious compound on admixture, and readily diffuses itself among the excreta. Scheurlen (Archiv f. Hyg., B. 4, '93).

TRIKRESOL, or tricresol, is a mixture of ortho-, meta-, and para-cresols from coal-tar. It is a colorless, oily liquid, soluble in about 40 parts of water. It is a germicide and antiseptic, and does not attack instruments or benumb the hands. It is much less irritant and less poisonous than carbolic acid or bichloride of mercury. In 1-per-cent. solution or ointment it is used in skin diseases and for surgical dressings. In weak solution (1 to 500 or 1000) it has been found useful

as an antiseptic collyrium in ophthalmic practice.

SULPHOCARBOLATES.—The sulphocarbates of sodium and zinc are largely employed as mild, local stimulants on ulcers or open wounds, in powder or in solution. They are more commonly given internally, as gastro-intestinal antiseptics, in foetid diarrhoea and in typhoid fever, in dose of 2 or 3 grains in pill, four or five times daily, the zinc salt being mostly used. They are probably voided by the intestines unchanged. Magnesium sulphocarbonate is proposed as an efficacious laxative and intestinal antiseptic in doses of 15 to 30 grains (F. Tarozzi).

[Other preparations of phenol may be found under CREASOTE, volume ii.]

C. SUMNER WITHERSTINE,

Philadelphia.

PHENOCOLL.—Phenocoll, or amido-aceto-phenetidin, is a derivative of phenacetin, produced by the action of glycoll, which is an amido-acetic acid, upon phenacetin. It occurs in white, matted needles, soluble in alcohol and slightly soluble in water. Several salts of phenocoll are in use, the hydrochlorate, salicylate, acetate, and carbonate. The hydrochlorate is most frequently used; it occurs in colorless needles or as a white powder, having a salty taste, with a sweetish after-taste and an aromatic odor, and is soluble in 16 parts of water, forming a neutral solution. It is incompatible with the alkalies. Its chief use is as an antipyretic, although it is also an antirheumatic, analgesic, and diaphoretic. It is best given in powder, as the aqueous solution, neutral at first, develops an alkaline reaction after two days.

Phenocoll salicylate, or salocoll, oc-

curs in fine needles having a sweetish taste, and is soluble in hot water. It has antipyretic, antiseptic, and analgesic properties.

The acetate (soluble in $3\frac{1}{2}$ parts of water) and carbonate have also been prepared.

Dose.—Any of these preparations may be given in doses of from 10 to 15 grains. The maximum daily dose is 75 grains.

Salocoll is well borne by the stomach; does not produce pain in the stomach, modification of the blood-pressure, or cyanosis; and has, apparently, no depressant effect upon the heart. It is used in the same dose and for the same purposes as phenocoll.

Physiological Action.—Phenocoll is rapidly eliminated; it may be found sometimes as soon as an hour after ingestion in the urine, and gives it a reddish-brown color. Balzer ascribed to phenocoll the power of markedly increasing nitrogenous elimination; but this is doubtful. Ott found that it produced paralysis of both motor and sensory functions of the spinal cord, death being due to diastolic arrest of cardiac action. Cerna and Carter, in a series of careful experiments, thus summarized the physiological effects of this drug: 1. Phenocoll, in ordinary amounts, has practically no effect upon the circulation. 2. Large doses diminish the blood-pressure by influencing the heart. 3. Phenocoll reduces the pulse-rate by stimulating the cardio-inhibitory centres. It then increases the rapidity of the pulse by paralyzing said centres. The final diminution is of cardiac origin. 4. Upon the blood itself phenocoll has no action.

Therapeutics.—Phenocoll has been given in fevers in the same manner as phenacetin; but, like phenacetin, it is contra-indicated in advanced exhausting

diseases. Cerna and Carter have shown that the very decided fall of temperature, which occurs the first hour after the administration of the drug by the stomach, is the result of an enormous diminution of heat-production, without any alteration of heat-dissipation; hence great care should be exercised in all diseases in which the vital powers are low. If too much diaphoresis is induced it may be controlled by the use of atropine. Phenocoll has been found useful in acute rheumatism and in neuralgias of various kinds.

Literature of '96 '97-'98.

Hydrochloride of phenocoll exerts a marked antithermic action in a period of time varying from half an hour to six hours. It is an excellent antiseptic, and a most useful antipyretic and analgesic in even the most severe and varied forms of neuralgia.

The use of increasing doses is not necessary. In grave conditions and in young children this drug does not produce nausea, vomiting, collapse, or any other disturbance. It lowers the temperature in a regular and continuous manner, often producing slight cutaneous transpiration, more rarely sweating. It acts not only on the great nervous centres, the cerebellum and spinal cord, but also on their peripheral ramifications, producing a slight warmth in the head and flushing of the face. It determines, although not constantly, varying degrees of dilatation of the pupil, especially in somewhat large doses, the mydriasis persisting even after all other characteristic symptoms of phenocoll have disappeared. Villani (*Gaz. Med. Lombarda*, Dec. 19, '98).

In malarial fevers 15 grains are given from two to six hours before the expected paroxysm. Phenocoll has no unpleasant after-effects and its taste may be disguised by mixing it with sugar. It may be combined with quinine. G. Cucco (*Therap. Monats.*, Apr., '93).

Phenocoll tried in 34 cases of malaria, with a permanent cure in 24, doubtful results in 5, and failure in the other 5. Some of the patients cured suffered severe relapses after treatment with quinine. To prevent relapses, phenocoll was given in 15-grain doses, in powder, six or seven hours before the expected paroxysms. The taste is easily covered by mixing it with sugar. Albertoni (*Riforma Medica*, Feb. 5, '92).

Phenocoll prescribed in 100 cases of intermittent fever rebellious to quinine. In 50 per cent. of the cases there was a cessation of the fever and no disagreeable after-effects. It is superior to all other remedies proposed for malaria. Pallettini (*Gaz. degli Osp.*, Jan. 14, '93).

Literature of '96-'97-'98.

Following conclusions reached regarding hydrochloride of phenocoll: 1. Hydrochloride of phenocoll is an excellent antipyretic, analgesic, and anti-rheumatic medicament. 2. It renders remarkable services in the treatment of malarial fevers, even in long-standing cases which have been rebellious to the salts of quinine, and it reduces the size of the spleen in malarial disease. 3. It is employed with advantage in chorea and in whooping-cough and as an antithermic in the different febrile diseases. 4. It is easily administered even to the most delicate children, and it is well tolerated by them as well as by adults. Dall' Ilio (*Gaz. med. Lombarda*, p. 34, '98).

INFLUENZA.—Hydrochloride of phenocoll has recently been recommended by Giovanni Villani (*Gaz. med. Lombarda*, Dec. 19, '98) as a very valuable remedy for the treatment of influenza, the author having personally used it in upward of 400 cases. The amount used was from 30 to 45 grains daily, administered in powders of $7\frac{1}{2}$ grains each for adults, and, for children, from 15 to $22\frac{1}{2}$ grains in solution in the course of twenty-four hours.

PERTUSSIS.—Phenocoll hydrochlorate successfully used in 42 cases of pertussis

by Vargas (*Ther. Woch.*, Jan. 5, '96). The dose was from 1 to 30 grains daily, given usually in mucilage or in water, in which it is soluble in the proportion of 1 to 7. In all of the cases treated the good results were noticeable within twelve hours, but in some cases the number of paroxysms was reduced only on the following day.

AS DRESSING.—Carl Beck, of New York, has used phenocoll externally as a dressing for accidental and surgical wounds, and for inflamed and suppurating cases. He uses a 10-per-cent. gauze, a 5-per-cent. watery solution, and a 10- or 15-per-cent. alcoholic solution. As a dressing for burns and ulcers, a 10- or 20-per-cent. ointment may be used, but the gauze gives better results. Phenocoll is inodorous and devoid of all irritating properties.

PHOSPHATURIA.

Definition.—The daily amount of phosphoric acid excreted with the urine amounts to 2 or 3 grammes; it is then combined with soda, potash, lime, and magnesia. Phosphaturia occurs when, soon after evacuation, a sediment is formed consisting of phosphates of lime and magnesia. In some cases the urine is already turbid when evacuated.

Etiology and Pathology.—Phosphaturia is sometimes observed during the course of diabetes. As it was formerly ascribed to defective metabolism, it was believed to be the cause of many nervous symptoms. This view, however, has recently been doubted by many authors. Phosphaturia is not necessarily due to an excessive formation and excretion of phosphoric acid, but is caused by a diminution of the acidity of the urine, such as that observed in neurasthenic individuals. In some cases it is due to the composition of the food; in other

cases, perhaps, to an abnormal acidity of the gastric juice.

Treatment.—Phosphaturia *per se* does not need any special treatment, and will ordinarily cease when the alimentation is properly regulated.

Following method recommended for separating the alkaline and earthy phosphates of urine: 30 cubic centimetres (1 fluidounce) of urine and 30 cubic centimetres (1 fluidounce) of a 5-per-cent. solution of caustic soda are mixed and allowed to stand for twenty-four hours, when 30 cubic centimetres (1 fluidounce) of the clear liquid remaining is poured out, free from earthy phosphates. To this is added 2 cubic centimetres (31 minims) of a 30-per-cent. solution of acetic acid to neutralize the soda and 5 cubic centimetres (1 $\frac{1}{4}$ fluidrachms) of a solution of acetic acetate (50 grammes—1 $\frac{1}{2}$ ounces—of acetate of sodium, 50 grammes—1 $\frac{1}{2}$ ounces—of acetic acid, water to make 1 litre—quart) heated to 60° C. (140° F.) and titrated with uranium. For the balance of the liquid, 2 cubic centimetres (31 minims) of acetic-acid solution and 5 cubic centimetres (1 $\frac{1}{4}$ fluidrachms) of acetic acetate are also used to dissolve the earthy phosphates and place it in identical conditions of acidity for titration. Richard (Jour. de Méd., de Chir., et de Pharm., Nov. 11, '93).

Certain albuminurias connected with functional disturbances of nutrition, which may be cured or may end in a renal lesion, are separated from Bright's disease. Its characteristic is organic demineralization. This phosphaturic albuminuria comprises four varieties: (a) simple phosphaturic albuminuria, confounded with cyclical, or intermittent, albuminuria; (b) pseudoneurasthenic phosphaturic albuminuria; (c) *pseudo-brightique* or *prébrightique* phosphaturia, confounded with interstitial nephritis; (d) albuminuria of Bright's disease of phosphaturic origin. A. Robin (Bull. de l'Acad. de Méd. de Paris, Dec. 19, '94).

Phosphaturia is met with: 1. In cases where there is digestive or nervous disturbance, the phosphatic urine indicating a diminution of the acidity; though

this may be called phesphaturia from a chemical stand-point, the term is not precise clinically. 2. In severer and long-continued cases, corresponding to phosphaturic diabetes insipidus. Here also there are no definite clinical conditions. Thorndike (Boston Med. and Surg. Jour., Feb. 8, '94).

F. LEVISON,
Copenhagen.

PHOSPHORIC AND HYPOPHOSPHOROUS ACIDS.

Phosphoric acid as used in medicine is orthophosphoric acid. The official acid is a colorless, syrupy liquid, without odor, having an intensely-acid taste. It should not contain less than 85 per cent. absolute orthophosphoric acid. It is soluble in all proportions in water and in alcohol. When heated above 392° F. it changes into pyrophosphoric acid. Dilute phosphoric acid should contain 10 per cent. of absolute acid.

Hypophosphorous acid is a clear, colorless, and odorless, sour liquid, miscible in all proportions with water, and is decomposed at high temperatures. The pure acid is not official. Dilute hypophosphorous acid should contain 10 per cent. of absolute acid.

Preparations and Doses.—Acidum hypophosphorosum dilutum (U. S. P.), 10 to 60 minims.

Acidum phosphoricum (U. S. P.), 3 to 7 minims.

Acidum phosphoricum dilutum (U. S. P.), 10 to 60 minims.

Physiological Action.—Pure phosphoric acid is a local irritant and escharotic. When taken internally well diluted, it stimulates the stomach and aids digestion. It stimulates the appetite, increases the salivary secretion, and acts as a general tonic. In large doses it acidifies the urine. Hypophosphorous acid is stimulant and tonic in its action.

Therapeutics.—The dilute acids in doses of 20 to 60 drops are useful as tonic and gastric stimulants. They are useful in nervous exhaustion in that they aid digestion by stimulating the stomach. In all debilitated conditions, as anæmia, the exhaustion of prolonged lactation, and in bronchial catarrh of the aged they are useful. Like the mineral acids, they should be given before meals in hyperacidity of the stomach. Phosphoric acid may be preferred to the mineral acids in typhoid fever when nervous prostration is a prominent symptom. The dilute acid may be used as a stimulant to indolent ulcers.

PHOSPHORUS.—Phosphorus is a non-metallic element. In the state of combined phosphoric acid it is contained in the ancient unstratified rock and in the lavas of modern times. As these disintegrate and crumble down into the fertile soil, the phosphates pass into the plants and ultimately as food into the bodies of man and animals. The earthy phosphates communicate rigidity to the bony skeleton.

Phosphorus was discovered in 1669 by Brandt, of Hamburg, who obtained it from urine. It is now obtained from bones. When pure, phosphorus very much resembles imperfectly bleached wax and is soft and flexible at common temperatures. It occurs in yellowish, semitransparent sticks, which have a waxy lustre when cut. It is luminous in the dark and when exposed to the air. It is soluble in chloroform, carbon disulphide, oils, 80 parts of ether, and in 350 parts of absolute alcohol.

Preparations and Doses.—Phosphorus (U. S. P.), $\frac{1}{100}$ to $\frac{1}{20}$ grain.

Elixir phosphori, U. S. P. (phosphorus, 0.025 per cent.), $\frac{1}{2}$ to 2 drachms.

Oleum phosphoratum, U. S. P. (phosphorus, 1 per cent.), 1 to 5 minims.

Pilulæ phosphori, U. S. P. (phosphorus, $\frac{1}{100}$ grain), 1 to 2 pills.

Spiritus phosphori, U. S. P. (phosphorus, 0.12 per cent.), 1 to 5 minims.

Liquor phosphori (Thompson's solution: $\frac{1}{20}$ grain of phosphorus in each drachm), $\frac{1}{4}$ to 1 drachm.

Calcii hypophosphis (U. S. P.), 5 to 30 grains.

Calcii phosphas præcipitatus (U. S. P.), 5 to 30 grains.

Ferri hypophosphis (U. S. P.), 5 to 10 grains.

Ferri pyrophosphas solubilis (U. S. P.), 2 to 5 grains.

Potassii hypophosphis (U. S. P.), 5 to 30 grains.

Sodii hypophosphis (U. S. P.), 5 to 20 grains.

Sodii phosphas (U. S. P.), 1 to 8 drachms.

Sodii pyrophosphas (U. S. P.), 2 to 20 grains.

Zinci phosphidum (U. S. P.), $\frac{1}{16}$ to $\frac{1}{3}$ grain.

Syrupus calcii lactophosphatis (U. S. P.), 1 to 2 drachms.

Syrupus ferri, quiniæ et strychninæ phosphatum, $\frac{1}{2}$ to 1 drachm.

Syrupus hypophosphitum (lime-salt, 4.5 per cent.; soda and potash salt, each, 1.5 per cent.), 1 to 2 drachms.

Syrupus hypophosphitum cum ferro (1 per cent. ferrous lactate and potassium citrate), $\frac{1}{2}$ to $1\frac{1}{2}$ drachms.

Physiological Action.—Phosphorus being a constituent of most tissues, it exerts a stimulating influence, when administered in small doses, upon their nutrition. This is particularly marked as regards the nervous and osseous systems. When, however, it is administered in toxic doses, it gives rise to changes in

the metabolism which Münzer (Deut. Archiv f. klin. Med., B. 52, H. 3, 4, '94) summarizes as follows, after an analysis of 15 cases of acute poisoning: During the first two or three days after the poison is swallowed there is a marked diminution in the total amount of nitrogen present in the urine, attributed not to the specific action of the phosphorus, but to the persistent vomiting and consequent state of starvation. On the second or third day after the poison is taken a marked increase in the excretion of nitrogen takes place, attributable to excessive destruction of tissue-proteids caused by the phosphorus. Usually death quickly occurs as soon as the amount of nitrogen has become very great; but in many cases there is a diminution both in nitrogen and of the quantity of urine excreted during the last hours of life. As regards the percentage of urea, if it is below 85 to 90 per cent. of the total amount of nitrogen excreted, disease of the liver, of such a kind as to interfere with its urea-forming function, is thereby indicated, the absent urea being replaced by excess of ammonia, which ought to have been converted into urea. But in some of the cases observed the quantity of urea excreted, after having been reduced very low, was subsequently increased three-fold, although the condition of the liver was progressively becoming worse. The view taken is that the excess of ammonia is solely due to development of acid products in the tissues, caused by the toxic action of the phosphorus, and not to arrest of the urea-forming function of the liver. In addition to the increase in ammonia there is excess of uric acid excreted in cases of acute phosphorus poisoning during the stage of rapid proteid metabolism, and also of nitrogenous extractives. Münzer failed,

with one exception, to find peptones in the urine.

The chlorides of the urine are rapidly diminished after the acute toxic effects of phosphorus develop. The excretion of phosphoric acid is increased during the first few days; afterward it progressively diminishes until death.

The excretion of sulphuric acid, upon the whole, runs the same course as that of phosphoric acid; ether sulphates are increased. No fatty acids—tyrosin, leucin—nor sarcolactic acid were found, nor any diamines. Chemical analysis of the brain-substance showed an increased percentage, and of the liver a decreased percentage, of phosphoric acid.

While phosphoretted hydrogen gives rise to the same toxic effects as those of phosphorus, red phosphorus is not poisonous; consequently the cause of the toxic quality of white phosphorus must lie in the production of phosphoretted hydrogen when in contact with living tissues. In other words, when white phosphorus is introduced into the digestive tract phosphoretted hydrogen is given off, which, being easily absorbed, passes into the blood and gives rise to disturbances which prevent hæmatosis. This pathogenesis being granted, a new method of treatment is to be followed, which consists in acting against the formation and absorption of phosphoretted hydrogen. J. Noe (Le Bull. Méd., Apr. 21, '95).

The physiological action of phosphorus in chronic poisoning was outlined in the section on diseases of the jaws (NECROSIS, PATHOLOGY).

Literature of '96-'97-'98.

Experiments conducted upon dogs who were poisoned by gradually increasing doses of phosphorus, given hypodermically in oil. Immediately after death the nervous tissues were fixed in corrosive-sublimate solutions and stained by Nissl's methods and its modifications and with Biondi-Heidenhain solutions.

In three dogs poisoned by phosphorus varied and diffuse changes of the cellular elements of the nervous system and of their elementary constituents were found. The changes in the spinal cord increased gradually from the anterior to the posterior roots.

The anatomo-pathological process consisted in a primary degeneration of the cortico-medullary cells, of those of the cerebellum and of the spinal ganglia with a varying amount of participation of the chromophilic substance of the dendrites. No changes were observed in the neuroglia nor in the blood-vessels. Enrico Rossi (*Riv. di Patol. Nerv. e Ment.*, vol. ii, p. 535, '98).

Poisoning by Phosphorus.—Poisoning by phosphorus may be acute or chronic.

ACUTE POISONING may occur from an overdose of any preparation of unoxidized phosphorus, or from swallowing phosphorus paste used for destroying vermin, or from chewing the tops of lucifer matches. Red phosphorus, an allotropic form made by heating (464° to 482° F.) phosphorus for fifty hours in an atmosphere which is unable to act upon it chemically, is not poisonous, and has replaced to a large extent the yellow variety in the manufacture of matches. In acute poisoning the rapidity with which the symptoms appear varies. Generally in from one to eight or ten hours the peculiar, disagreeable taste of phosphorus is noticed in the mouth and the breath is heavily laden with its odor. An intense warmth in the œsophagus, stomach, and bowels develops gradually into a violent, burning pain, which extends all over the abdomen. Eructations having a garlicky odor, followed by nausea, vomiting, and purging now follow. The vomited matters at first consist of food and later of mucus, bile, and, perhaps, blood; the color of the vomited matter is usually dark, the odor of phosphorus is present,

and it with the dejecta may be luminous in the dark, owing to the presence of phosphorus. The pupils are dilated, the abdomen distended, the extremities cold, the pulse weak, and the thirst intense. Constipation is sometimes present instead of purging. Very soon the liver increases in size and is the seat of pain and tenderness. After twenty-four or forty-eight hours the symptoms abate and symptoms of acute yellow atrophy of the liver develop. Jaundice appears, first in the conjunctivæ, and then extends over the whole body. Vomiting and pain now return, "coffee-ground" matter is vomited, showing the presence of altered blood. The bowels are now confined, or, if moved, the stools are clay-colored, showing the absence of bile. Bile is also absent from the vomited matter. The urine is often retained. Nervous symptoms develop—muscular twitching, headache, vertigo, delirium, and convulsions, or coma—and death ensues. If the patient survive the acute stage, he generally dies of general fatty degeneration of the internal organs. Recovery is rare.

The smallest doses of phosphorus known to have destroyed life were $1\frac{1}{2}$ grains in a man, $\frac{1}{8}$ grain in a woman, and $\frac{1}{50}$ grain in a child. Death in cases of acute poisoning usually takes place within three to six days. In one recorded case death occurred in half an hour. Chronic cases may last for months or even years.

[In phosphorus poisoning a patient is safe if jaundice does not supervene within a few days, or at most within two or three weeks. F. W. DRAPER, Assoc. Ed., *Annual*, '94.]

In acute phosphorus poisoning death is probably due to the toxic action of certain products of cellular metabolism, which the liver and kidneys are unable to eliminate on account of the profound changes that have taken place in them.

Lo Monaco and Trambusti (Lo Speri., p. 26, '94).

CHRONIC POISONING may result from exposure to phosphorus-fumes in match- and other factories or from the long-continued use of large doses of the drug. The most common symptoms of chronic poisoning by phosphorus are fatigue, abdominal pains, anorexia, dyspepsia, diarrhoea, sometimes obstinate constipation, intermittent headache, more or less cough, and necrosis of the lower jaw, if the teeth are carious, attended by swelling and distension of the gums with pus (see JAWS, DISEASES OF). The complexion becomes sallow. The skin may be the seat of an eruption. The hair falls out. There is an increase of phosphates in the urine.

All the men employed in State match-factories in France, in the making of white-phosphorus matches, constantly inhale the noxious vapors, and they all, without exception, suffer more or less from phosphorism. Magitot (Med. Press and Circ., Mar. 23, '95).

Treatment of Poisoning by Phosphorus.

—The researches of E. Q. Thornton, of Philadelphia (Ther. Gaz., Jan., '93), have developed the fact that the use of sulphate of copper as an antidote is dangerous, and that the best antidotes are the permanganate of potash and hydrogen peroxide, which act chemically by oxidizing the phosphorus and thus destroying its poisonous character. Thornton prefers potassium permanganate because peroxide of hydrogen is too slow in its action. The permanganate is used in a $\frac{1}{2}$ - to a 1-per-cent. solution by mouth, or a 1 to 1000 solution may be used to wash out the stomach. A pint of this latter solution has been used with success half an hour after the poison was taken.

Permanganate of potassium is the best antidote for phosphorus. Administration of the potassium salt advised be-

fore the phosphorus becomes absorbed, since vomiting will generally prevent the chemical reaction. The antidote must be well diluted (0.5- to 1-per-cent. solution), and must be given in excess, from the fact that a large portion of the permanganate is reduced by the organic substances of the stomach. E. Q. Thornton (Ther. Gaz., Jan., '93).

Permanganate of potassium has absolutely no antidotal virtues *per se* against phosphorus, for not even contact of these two substances lasting sixteen hours will result in any mutual reaction. W. Moor (N. Y. Med. Jour., Feb. 2, '95).

At clinic of von Jaksch, in Prague, from March, 1894, to March, 1895, twelve cases of phosphorus poisoning were observed which were treated according to the suggestion of Antal.

In the first place, the stomach was washed out with a large quantity (fifty or more quarts) of 8-per-cent. solution of permanganate of potassium, and finally one quart of a $\frac{1}{2}$ -per-cent. solution was introduced into the stomach and left there. In addition, on the same day infusion of senna was given as a purgative, and on the following days large doses of bicarbonate of sodium were given, and also old oil of turpentine, 5 drops three times daily.

Five patients died; in fact, all but one, who received 3 grains or more of phosphorus. Fr. Lanz (Ther. Gaz., Nov. 15, '95).

Oils must be avoided in all cases, as phosphorus dissolves in them and thus absorption is favored. The value of old turpentine (French turpentine) should not be forgotten, used preferably after an emetic (cupric sulphate, 3 grains well diluted, repeated every five minutes until vomiting occurs).

Since old French oil of turpentine cannot be obtained, it should cease to be considered as a practical antidote. E. Q. Thornton (Ther. Gaz., Jan., '93).

The administration of magnesia or sulphate of magnesia is desirable, to empty the bowels and promote elimination. Further treatment will be directed

by the symptoms present; stimulants and anodynes are usually indicated.

In chronic poisoning immediate withdrawal from the infected atmosphere is demanded. The teeth and gums of those working in the presence of phosphorus-fumes should be carefully looked after, and kept in good order.

Therapeutics.—Certain precautions should be taken during the period of medication by phosphorus. Frequent observation of the patient is not only desirable, but necessary, for the prompt detection and relief of the first symptoms of overeffect; phosphorus should never be given long in large doses; phosphorus is not indicated in diseases attended by acute or inflammatory lesions; phosphorus should never be given in substance, but in the form of an alcoholic or oily solution. Phosphorus is chiefly indicated in malnutrition of nerve and bone.

Attention called to the different forms of phosphorus which are to be used in the treatment of various diseases. The hypophosphites are useful in wasting diseases, such as phthisis. Phosphorus itself, in oily solution, or the phosphide of zinc, seems to be most suitable in neuralgia and nervous disorders, and the acid salts in various gastric disorders. Joseph Eichberg (*Gaillard's Med. Jour.*, July, '89).

In administering phosphorus the action of the remedy upon the digestive organs should be carefully watched. Jenches (*Boston Med. and Surg. Jour.*, Nov. 28, '95).

OSSEOUS DISORDERS.—The beneficial action of phosphorus in certain diseases of the bones is acknowledged. In rachitis and osteomalacia phosphorus is perhaps best combined with codliver-oil or lipanin (an artificial mixture devised by von Mering, as a substitute for codliver-oil, consisting of 6 parts of oleic acid to each 100 parts of olive-oil, and

being free from disagreeable odor and taste, readily emulsified, and easily digested): phosphorated oil, 16 minims; codliver-oil, 4 ounces. A teaspoonful four times daily. Kassowitz suggests: Phosphorus, $\frac{1}{6}$ grain; saccharin, 72 grains; essence of lemon, 2 minims; codliver-oil, $3\frac{1}{2}$ ounces. A teaspoonful three times daily. J. Comby gives the following modification of Trousseau's formula: Phosphorus, $\frac{1}{7}$ grain; iodide of potash, 4 grains; bromide of potash, 15 grains; table-salt, 2 drachms; fresh butter, $17\frac{1}{2}$ ounces. Of this mixture about $\frac{1}{3}$ ounce is given daily, spread upon bread.

NERVOUS DISORDERS.—Phosphorus is a valuable tonic and restorative in neurasthenia, or nervous debility, when the system is weakened by anxiety, overwork, or sexual excesses. It is also a valuable tonic in the neuralgia of the asthenic type, but has little influence over pain. It is frequently given with good result in herpes zoster. In the weakened conditions following acute and chronic alcoholism and morphinomania good effects may be obtained from the administration of phosphorus. Phosphorus will support the system when exposed to severe and prolonged mental and physical strain. In cerebral atony and mental enfeeblement, even if symptomatic of organic brain-lesion, phosphorus will yield good results; indeed, it is not useless in cerebral softening, cerebral endarteritis, and paralysis of cerebral origin, and meningitis of a chronic type.

Insomnia, when due to cerebral anæmia and malnutrition, has often been removed by phosphorus. Mania and paralysis agitans may be relieved, and in some cases of locomotor ataxia and spinal sclerosis improvement has followed medication by this drug. In functional im-

potence or sexual exhaustion the influence of phosphorus is marked.

DISORDERS OF THE BLOOD AND VASCULAR ORGANS.—Phosphorus is not infrequently beneficial in the treatment of angina pectoris.

In anæmia small doses of phosphorus, in conjunction with iron, will yield good results. In pernicious anæmia small doses of phosphorus seem to check the progress of the disease. In small doses, continued over long periods, it will arrest fatty degeneration of the heart and ameliorate the symptoms due to it. Atheroma of the vessels is amenable to the influences of phosphorus.

FEBRILE DISORDERS.—Phosphorus will be found of use as a restorative after typhoid fever and typhoid pneumonia, especially if the nervous system be particularly affected in prolonged cases; it hastens convalescence and repairs the shattered forces of the patient. Phosphorated oil is said to be valuable in intermittent fever, and also in the eruptive fevers (measles, scarlatina, etc.) when the rash recedes or does not come out promptly. In the third stage of pneumonia phosphorus is said to aid resolution.

CUTANEOUS DISORDERS.—In skin diseases phosphorus may often be substituted for arsenic, with advantage. In boils and carbuncles, in acne indurata or inveterata, in psoriasis, and in eczema of nervous origin calcium phosphate or the alkaline hypophosphites are valuable. In lupus erythematosus, L. D. Bulkley, of New York, has found phosphorus invaluable. He uses Thompson's solution, as it causes less gastric and hepatic disturbance than the oily solutions or pills. (Thompson's solution of phosphorus is made by dissolving 1 grain of phosphorus in 5 drachms of absolute alcohol with gentle heat, and add-

ing a warmed mixture of 1 $\frac{1}{2}$ ounces of glycerin, 2 drachms of alcohol, and 40 minims of spirit of peppermint; one drachm of this solution contains $\frac{1}{20}$ grain of phosphorus.) He begins with 15 minims of the solution, quickly added to water and quickly taken, after meals thrice daily. The dose is gradually increased until 40 to 45 drops are taken; exceptionally, the dose may be increased to 60 drops. If gastric disturbance appear, it should be attended to and the drug stopped. If constipation be present, a pill of blue mass, colocynth, and ipecac is indicated. When the gastric functions are restored, the use of phosphorus should be resumed. The treatment may be continued, with careful watching, for months, in this malady, and great benefit may be expected.

Hyperidrosis due to nervous debility is checked by phosphorus.

Therapeutics of the Phosphates and Hypophosphites.—The hypophosphite of calcium and the precipitated phosphate of calcium are of value in the treatment of scrofulosis, struma, and rachitis. The hypophosphites and lactophosphites are found useful in rickets and in slow and delayed union of fractured bones. In dental caries and anæmia of nursing women, in general debility and nervous prostration, and in hepatic torpor they will do good.

The lactophosphates and hypophosphites are simply convenient modes of administering calcium, potassium, and other substances, while phosphorus acts as a stimulant to bone-growth and not by its deposition in the bone; this difference between these salts and phosphorus should be clearly borne in mind. (Hare.)

Phosphate of sodium is considered by Bartholow the best remedy in hepatic cirrhosis and jaundice, in doses of 20

grains to 2 drachms, in single dose or repeated several times a day, according to the laxative effect desired. Hare recommends phosphate of sodium for bottle-fed children, who continually alternate between diarrhoea and constipation, added in doses of 2 to 4 grains to each bottle of milk.

The hypophosphites have been largely used in the treatment of incipient phthisis. R. W. Gardner, of New York, has followed out the suggestions of Churchill, in the preparation of various syrups of the single hypophosphites. Churchill advises against a combination of different hypophosphites because the different bases are indicated in different stages of the disease: Soda in the incipient stage; lime in the second and third stages; quinine hypophosphite in the initial treatment of far advanced cases, to be followed by lime or soda later on; lime reduces expectoration; soda favors expectoration; the tendency of the hypophosphites is to create plethora; therefore discrimination in dosage is necessary, when there is any tendency to pulmonary hæmorrhage.

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PHTHISIS. See TUBERCULOSIS.

PHYSOSTIGMA.—Physostigma (U. S. P.). Calabar bean, or Ordeal bean of old Calabar, is the seed of *Physostigma venenosum* (nat. ord., *Leguminosæ*): a woody creeper indigenous to western Africa along the River Niger. It contains the alkaloids physostigmine (also called eserine), eseridine, and calabarine, physosterin (a substance related to cholesterolin), starchy matters, oils, etc.

Physostigmine occurs in colorless,

very hygroscopical crystals, readily altering to a resin-like mass. It is soluble in alcohol, ether, and chloroform and sparingly soluble in water. It forms salts with the acids, which vary in solubility; the salicylate and sulphate are official.

Physostigmine salicylate occurs in colorless or slightly-yellowish, lustrous crystals, soluble in 150 parts of water. This salt is least affected by the light, but must be kept dry. Solutions of this salt deteriorate on standing and become brownish-red in color when spoiled for use; when freshly made, they are of a faint-pink color.

Physostigmine sulphate occurs as a white or slightly-yellowish, deliquescent, crystalline powder, of bitter taste. It is freely soluble in water and alcohol. This salt should be kept dry and away from the light.

Eseridine occurs in white, four-sided crystals, soluble in alcohol, ether, and chloroform. Eseridine is a laxative and motor-excitant. It is one-sixth as powerful as physostigmine.

Calabarine is said to act much like strychnine.

Preparations and Doses.—Physostigma, U. S. P. (Calabar bean), $\frac{1}{2}$ to 2 grains.

Extractum physostigmatis, U. S. P. (alcoholic extract), $\frac{1}{10}$ to $\frac{1}{2}$ grain.

Tinctura physostigmatis, U. S. P. (15-per-cent. strength), 5 to 10 minims.

Physostigminæ salicylas (U. S. P.), $\frac{1}{100}$ to $\frac{1}{30}$ grain.

Physostigminæ sulphas (U. S. P.), $\frac{1}{100}$ to $\frac{1}{60}$ grain.

Physiological Action.—The physiological action of Calabar bean has been studied by a large number of observers, a summary of whose labors tends to demonstrate that the main effects of the drug are exercised upon the motor

centres of the spinal cord. This action involves depression of the respiratory centres of the medulla, and, by reflex action, an increasing paralysis leading to paralytic asphyxia. The cerebral cortex, the sensory nerves, and the sensory nerve-centres suffer no loss of function, while the motor nerve-trunks are scarcely involved under normal circumstances. Poisonous doses, however, may cause all these structures to be more or less affected. Wood concludes that "Calabar bean acts directly either upon the muscle-structure itself or upon the peripheral nerve-endings in the muscles, producing contraction, and not paralysis. The influence of the drug upon the circulation is entirely subordinate and is not at present completely understood. Early in the poisoning there is a rise of the blood-pressure, which is, in great part, if not altogether, due to a direct stimulation of the cardiac muscle and its contained ganglia. The action of the drug upon the vasomotor centres remains at present in doubt."

Physostigma increases peristaltic action. Traversa (*Il Policlinico*, No. 1, '98) recently studied the action of its main alkaloid, physostigmine, in this direction, and found that it not only exaggerates the peristaltic movements, but also causes a violent and generalized contraction of the intestine and, finally, tetanus and contractures. If the contraction predominates in the longitudinal fibres, the intestine becomes wrinkled; if in the circular, it is beaded, ringed, or, if the contraction is violent and diffuse, ribbon-like. The higher nerve-centres (the vagus, spinal cord, and abdominal sympathetic ganglia) have no influence upon the production of these phenomena.

A loop of intestine detached from the body and kept alive by artificial cir-

culation gave the same reaction to physostigmine as intestines in the living body. He concludes, therefore, that the changes in motor activity do not depend upon the modification of the intestinal circulation. Physostigmine produces exaggerated peristalsis and violent and diffuse contractions of the intestine solely by excitation of the peripheral motor apparatus. Traversa further calls attention to the fact that, so far as the intestine is concerned, the action of physostigmine is identical in intensity and duration as well, and of effect with pilocarpine, not only nosographically, but mechanically.

Poisoning by Physostigma.—In toxic doses physostigma is a powerful poison, producing extreme muscular debility, vomiting (may be absent), and giddiness, followed by paralysis of the voluntary muscles, convulsive muscular twitchings, and invariably a contraction of the pupil. The respirations become slow and irregular, the pulse slow and weak, and there is an abolition of all the reflexes. Death may occur either by cardiac syncope, or, if taken in smaller quantity, by paralysis of the respiratory centre and asphyxia. The mind is usually clear to the end. Death has occurred from 19 beans in the adult, 6 beans in a boy, and an extreme degree of collapse resulted from the hypodermic injection of $\frac{1}{20}$ grain of physostigmine into a child nine years of age: profuse diaphoresis, vomiting and collapse, with pulse 54, and scarcely perceptible and greatly diminished pupillary reflex (*Lodderstädt*).

Treatment of Poisoning by Physostigma.—If the crude drug (powdered beans) or extract have been swallowed, evacuation (by emetic or stomach-siphon) and lavage of the stomach are indicated. Atropine is the physiological

antidote. It should be promptly administered, $\frac{1}{64}$ to $\frac{1}{24}$ grain being hypodermically injected in a severe case, repeated, as need be, until the pupils are dilated. Chloral is also antidotal to physostigmine. External heat to the body and respiratory and cardiac stimulants—such as digitalis, alcohol, and ammonia—will be found useful. Artificial respiration may be necessary.

Therapeutics. — **SPASMODIC DISORDERS.**—Physostigma is a useful remedy in all spasmodic disorders. In tetanus recovery has followed its use in more than 50 per cent. of reported cases. Fraser recommends it to be given until decided physiological effects are produced. He advises 1 grain of a good extract by the mouth ($\frac{1}{3}$ grain hypodermically), repeated every two hours, and increased or diminished according to the effect produced. In other nerve affections great improvement has been noted, especially in chorea, in epilepsy, in locomotor ataxia, and in progressive paralysis. Trismus neonatorum is amenable to its action. In convulsive disorders of individual muscles (tic, twitching of the orbicularis, histrionic spasm, etc.) its action is satisfactory. In writers' cramp and in hiccough its use has been successful.

RESPIRATORY DISORDERS. — Physostigma is useful in bronchial asthma and emphysema, as it aids in the expulsion of the mucus by its action upon the muscular fibres in the walls of the bronchial tubes. Murrell has shown that this drug acts very favorably in night-sweats of phthisis; the effect of a single dose may persist for three or four weeks: he gave $\frac{1}{60}$ grain of extract in pill, two or three times during the night, or $\frac{1}{60}$ grain of eserine salt.

GASTRO-INTESTINAL DISORDERS.—Physostigma is an efficient remedy in

atony of the intestines and in catarrh of the bowels. Hare commends its use in cases of gastric and intestinal dilatation, combined with nux vomica. In purgative pills it is useful to stimulate the muscular fibres of the intestines and thus favor peristalsis. In constipation due to defective secretion and to insufficient peristalsis the following is useful: Extract of physostigma, 3 grains; alcoholic extract of belladonna-leaves, 1 grain; resin of podophyllum, 3 grains; oil of cajuput, 4 minims. To be made into 12 pills; one or two to be taken at night. Bartholow advises equal parts of the tinctures of physostigma, nux vomica, and belladonna, 30 drops in water, to be taken morning and evening.

URINARY DISORDERS. — Physostigma has been used successfully in atony of the bladder. Giovanni, of Turin, has obtained good results from this drug in cases of renal hæmorrhage. He combines it with ergotine: Extract of physostigma, 6 grains; ergotine, 30 grains; extract of gentian, a sufficient quantity. This makes twenty pills, one or two of which are taken daily, increased daily until effectual or the limit of tolerance is reached.

ANTIDOTAL USES.—Physostigmine is a physiological antidote in atropine poisoning. With the bromides it may be found useful in strychnine poisoning.

OPHTHALMIC DISORDERS. — The physostigmine salts are used extensively in ophthalmic practice on account of their myotic power and their power to relieve high intra-ocular tension. It is not well borne in acute inflammation, or if much ciliary congestion is present (M. L. Foster). It is positively contra-indicated in the acute stage of iritis, but is used by some oculists to break up iritic adhesions after the subsidence of the acute symptoms. According to some observers, it

has a tendency to increase opacities of the crystalline lens; this should be borne in mind in connection with cases of incipient cataract. In corneal ulcerations it is often preferable to atropine, and its use may prevent prolapse of the iris after wound or ulceration of the cornea.

In the treatment of glaucoma this drug is generally satisfactory. A solution of physostigmine salicylate ($\frac{1}{2}$ to 1 grain to 1 ounce of recently-boiled water) instilled into the eye two to five times daily will reduce the tension and pain very decidedly. In some cases prolonged treatment results in permanent cure without iridectomy; in others the tension returns in a few hours after its discontinuance. In phlyctenular keratitis it is useful in diminishing photophobia. Cameron has used this drug successfully in paralytic mydriasis following diphtheria. Instillations of physostigma solution may be used to rapidly overcome atropine mydriasis when desired; as the action of atropine is the more persistent, it may return as the effects of the physostigmine wear off, and necessitate a repeated use of the latter. The solutions used in ophthalmological work generally vary in strength from $\frac{1}{2}$ to 2 grains of the physostigmine salt to the ounce of recently-boiled water.

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PICRIC ACID.—Picric acid (trinitrophenol; picronitric, picrinic, carbazotic, nitroanthic, or nitrophenisic acid) is obtained from phenol (carbolic acid) by nitration. It occurs in yellowish, lustrous, flat crystals, without odor, but of an intensely-bitter taste. It is soluble in alcohol, ether, chloroform, benzene, and slightly soluble in water. It is an antiseptic and an oxidizing substance.

Physiological Action.—The main action of picric acid seems to be exercised upon the blood, that of rabbits slowly poisoned by it having been found by Erb to assume a dirty-brownish hue. Distinct nuclei were found floating in the serum in their free state, and in the red corpuscles, while the white corpuscles were markedly increased in number. It causes distinct jaundice in man, in suitable doses, the skin, conjunctivæ, and urine being colored reddish yellow. Poisonous doses cause hypothermia, diarrhœa, collapse, and death.

Therapeutics.—Picric acid was formerly used internally in malarial diseases, in trichiniasis, and as an anthelmintic and tonic. Experience has shown that it possesses little or no action in these conditions. In doses larger than 5 grains it is poisonous (antidote: albumin).

It is chiefly used after the method of the French surgeons, Thierry and Filleul, for the treatment of burns and scalds. In solution (1 to 200) it is analgesic, antiseptic, and keratogenous, and its use is free from the accidents sometimes provoked by antiseptics, as it is not irritant, caustic, or toxic. Filleul (l'Union Pharm., Dec., '95) advises the use of a solution obtained by adding the crystals to boiling water, the excess being removed by decanting. The golden-yellow solution thus obtained is left to cool in a vessel stoppered with cotton to insure asepsis. After cleansing the burn and pricking all blisters, compresses of tarlatan previously boiled to remove the stiffness, or plain aseptic cheese-cloth or gauze, are dipped into boiling water, then into the solution, wrung out, and applied in several thicknesses over the burning areas. Over this may be placed a layer of dry absorbent cotton, fastened in place by a roller bandage lightly ap-

plied. The dressing dries rapidly and may be left in place several days. For removal it is moistened with the solution so as to soften it. A fresh dressing is applied and left for a week. This application relieves all pain, inhibits suppuration, and leaves a smooth cicatrix (Thierry, *Provincial Med. Jour.*, Dec. 2, '95).

Hare suggests the following solution: Picric acid, 75 grains; alcohol, $2\frac{1}{2}$ ounces; distilled water, 2 pints. Mix. (See BURNS, TREATMENT.)

Literature of '96-'97-'98-'99.

Case of poisoning with picric-acid solution applied locally, in adult patient. There occurred much prostration and all the symptoms of carboluria, with very dark urine. Henry Waldo (*Brit. Med. Jour.*, Feb. 6, '97).

Picric acid is only useful in burns of the first and second degrees, its particular action being to stimulate the growth of epidermis. It allays pain. In burns of the third degree it checks suppuration, but does not hasten granulation. C. Willems (*Ann. de la Soc. Belge de Chir.*, May 15, '98).

By use of picric acid healing in burns of the first and second degrees takes place rapidly without suppuration. The punctured vesicles must be accurately flattened out. No impermeable material must be placed over the simple gauze, which should be dipped in a saturated aqueous solution of the acid and applied after being squeezed fairly dry. Absorbent wool and a light gauze bandage further encourage evaporation, and thus retard the growth of any bacteria which may have gained access to the wounded surface. A pair of thin rubber gloves may be used to avoid the staining of the dresser's hands by the acid. Renewal of the dressing need not take place for four or five days, unless there are clear signs of suppuration. Reckett (*Brit. Med. Jour.*, May 13, '99).

Picric acid recommended in the treatment of superficial burns: (1) because of its simplicity of application, (2) its

painlessness, (3) the rapidity of its healing power, (4) absence of local irritation or of general toxic effect, and (5) the production of a smoother, more natural cicatrix than that obtained with other methods. McDonald (*Brit. Med. Jour.*, May 13, '99).

Picric acid has been employed by Cheron as a caustic and antiseptic after curetting the uterus for fungous endometritis; he used a watery solution (1 to 300). In a weaker watery solution (1 to 1000) it has been used in eczema, erysipelas, lymphangitis, fissured nipples, and in impetiginous eczema, after removing the crusts with oil.

Literature of '96-'97-'98.

In all those very troublesome cases of chronic simple diarrhœa and so-called putrid diarrhœa, with very offensive stools, often when opiates and other astringents have failed, picric acid in grain doses has given rapid relief. The icteric discoloration is first noticed after from 15 to 20 grains have been given, and it disappears shortly after the use of the drug is discontinued. W. Maclellan (*Brit. Med. Jour.*, Dec. 26, '96).

Acute eczema is rapidly relieved under the influence of picric acid. Applied as a pigment with a brush or piece of absorbent wool, even to an extensive surface, it is quite free from danger, and causes not the slightest pain, however vascular the surface may be. Almost immediately itching and smarting abate, and in a few days, when the protective crust is removed or separates, the underlying skin is found to be comparatively dry, free from redness, and covered with a young epidermis. W. Maclellan (*Brit. Med. Jour.*, Dec. 26, '96).

Generally speaking, picric acid is indicated in those forms of eczema in which the inflammation is acute and superficial, and where the lesions are mostly epidemic. The keratogenic properties of the agent find an excellent field of action in acute eczemas with the swelling of the integument, superficial ulceration, and weeping. In acute eczema a cure is

effected in from ten to fifteen days. A solution of 3 drachms of picric acid in one quart of tepid boiling water is painted over and somewhat beyond the affected surfaces; the parts are then wrapped in lint wrung out of the same solution, and over this is placed a covering of cotton-wool. Oiled silk should not be used. The dressing should be renewed every two or three days. Aubert (*Thèse de Paris*, No. 32, '97).

Striking results obtained in the treatment of acute eczema and of various forms of artificial dermatitis from picric acid. The affected regions are covered with compresses dipped in a saturated aqueous solution, and enveloped in impermeable tissue. The dressing is changed daily. It possesses no advantage in chronic eczema. Leredde (*Ann. de Derm. et de Syph.*, June, '97).

Picric acid has been used in watery solution (15 grains to 1 ounce) as a test for albumin in urine. Though delicate, it is unreliable, as it also precipitates mucin, peptones, and potassium salts. It has also been used for the detection of sugar in urine, but is inferior to other well-known tests.

In pathological and histological work picric acid is used for staining and fixing specimens. In combination it is also used for the decalcification of bones and teeth.

PILOCARPINE. See JABORANDI.

PIPERAZIN.—Piperazin (pyrazin hexahydride, dispermin, di-ethylene-diamin; piperazidin; ethylene-imin) is obtained by the action of ammonia upon ethylene bromide or chloride. It occurs in colorless, transparent, deliquescent needles, which absorb carbonic acid from the air. It is very soluble in water, the solution being practically tasteless and having an alkaline reaction. It must be kept from the air.

Piperazin is incompatible with alka-

loids and the salts of iron, tannic acid, alum, preparations of cinchona, Donovan's solution, potassium permanganate, sodium salicylate, acetanilid, and phenacetin.

Dose.—The dose of piperazin is 15 grains per day. This quantity is dissolved in a pint of plain or carbonated water and taken in tumblerfuls at equal intervals. The solution must be prepared fresh each day.

It cannot be prescribed in pill form on account of its highly hygroscopic property.

Physiological Action.—Piperazin forms with uric acid piperazin urate, a neutral and very soluble salt, even if the uric acid is present in excess. Upon its solvent power over uric acid rests its value in practice. In the laboratory it will act not only upon granular uric acid, but upon the hardest uric-acid calculi, and if the calculi are not composed of pure uric acid, it will cause them to disintegrate by dissolving out the uric acid and leaving the rest to crumble. The albuminous substances forming a part of calculi are also dissolved. Piperazin will render soluble twelve times as much uric acid as lithium carbonate; moreover, piperazin urate is seven times as soluble in water as lithium urate.

When taken in moderate doses, it is quickly eliminated by the kidneys, and gives the urine a brownish-red color. Ebstein and Sprague did not find by examination of the latter that the output of uric acid or urea was increased; indeed, Vogt has argued that in doses of 15 grains a day it checked uric-acid elimination.

Regarding piperazin, following conclusions are formulated: 1. Piperazin is not wholly oxidized in the body, and may be detected in the urine of those to whom it is exhibited. 2. In solutions of 1 per cent. in normal urine, when kept

in contact at a temperature of 102.2° F. for a given time, it has the property of dissolving to a great extent a fragment of a uric-acid calculus. 3. The stronger the solution of piperazin in urine (up to 7.5—), the earlier did the solvent action begin and the more rapid was the completion. 4. Notwithstanding this, with the stronger solutions of piperazin in urine the rate of solubility was not so markedly rapid over the weaker solutions as might be expected. 5. The solvent action in similar circumstances was greater than any other of the substances employed: namely, borax, lithium citrate, sodium carbonate, and potassium citrate. 6. Piperazin, in weak and strong solutions in urine, converted the undissolved portion of the calculus into a soft granular or pulpy condition. 7. Neither borax, lithium citrate, sodium carbonate, nor potassium citrate, in similar circumstances, rendered the fragment of calculus soft or pulpy. John Gordon (Brit. Med. Jour., June 16, '94).

Poisoning by Piperazin.—D. D. Stewart (Ther. Gaz., Feb., '94) has noticed untoward effects when large doses have been given: Feelings of nervousness and apprehension (hallucinations); intermittent clonic spasms of the upper extremities, spreading to the muscles of the abdomen and legs, the patient becoming dazed, unable to think clearly, and for some hours partly unconscious; muscular prostration, with inco-ordination; coarse tremors, uncertainty of gait for several days, due rather to impairment of co-ordination than to any parietic condition of the muscles.

Literature of '96-'97-'98.

Case of poisoning from 20 grains of piperazin taken at once. When seen, three or four hours after taking the drug, the patient was found cyanosed and semicomatose, with pupils contracted; pulse, 50; and temperature, 97.4° F. The respiration was depressed and muttering delirium present. Tips of fingers and lips were cyanotic. Loss of motion

complete in lower limbs, but sensation almost intact. Reaction established after several hours. Next day loss of motion returned and hypostatic congestion of both lungs present. On sixth day of treatment paraplegia disappeared. C. H. P. Slaughter (Med. News, Mar. 14, '96).

Treatment of Poisoning by Piperazin.

—In the case mentioned by Slaughter cardiac and respiratory stimulants were administered. External heat was applied to the limbs and trunk, and the lower limbs were elevated. A high, stimulating rectal injection was administered and the patient was catheterized. The paralytic symptoms (paraplegia) were treated with large doses of strychnine. The patient fully recovered.

Therapeutics.—Piperazin was introduced as a solvent of uric acid. It has been found an effective remedy in various manifestations of the uric-acid diathesis. Renal and vesical calculi, due to the deposit of uric acid, have been disintegrated and expelled through the use of piperazin. It has been given with the idea of preventing the formation of renal and vesical calculi. It is useful in irritation and inflammation of the bladder arising from an excess of uric acid in the urine. For this purpose it may be given internally, or the bladder may be irrigated with a 1-per-cent. solution.

It has been used in diabetes and has been found especially useful when associated with gout. It has been found beneficial in renal colic and in hæmorrhage from the urinary passages.

In the uric-acid diathesis piperazin must be administered continuously for a fortnight before an opinion can be formed: 1. Diuresis is considerably increased, the urine passed in a case of arthritis having been doubled. 2. Specific gravity of the urine lowered, but it never becomes alkaline or even neutral.

3. The appetite is not affected, and no disturbance of the general condition has been observed. The hydrochloric salt of piperazin is better than free base-product, being less hygroscopical. Wittzack (Notes on New Remedies, Mar., '93).

Piperazin has little effect in lessening the acidity of the urine, but causes a marked diminution in the amount of crystalline urates. The drug employed in doses of $15\frac{1}{2}$ to 31 grains a day, in 5 cases of gout, seemed to possess no more energetic powers than the ordinary alkaline waters. Mordhorst (Les Nouv. Rem., May 8, '92).

Case of excruciating renal colic in a woman, the attacks recurring two or three times every month. The usual treatment by mineral waters and careful dieting utterly failed. Internal administration of piperazin in the daily dose of $15\frac{1}{2}$ grains was tried. Attacks became mild, while the urine assumed a peculiar reddish color (due to the presence of urate of piperazin). During one such attack the patient voided with her urine a brownish, corroded, small-sized stone, after which the reddish tint became nearly imperceptible, and then disappeared altogether. Shortly afterward the attacks ceased, and up to the time of the report—a year and a half—had not recurred. Egoroff (Bohnitch. gaz. Botkina, No. 34, '94).

Literature of '96-'97-'98.

Piperazin extensively used. No toxic symptoms of any sort have ever been observed from a moderate dose, as of $\frac{1}{2}$ drachm daily, although the drug has been continued for long periods of time. The limit of tolerance seems to be about 1 drachm daily. It was found in experiments that the two different makes of basic piperazin on the market (neither of which, by the way, is Merck's) differed from each other quite markedly in degree of tonicity. This difference was ascertained to be due to a matter of concentration of the drug in the more toxic; *i.e.*, to a much smaller amount of water of crystallization. It is on account of this that a stable salt of piperazin is preferable for administration to the basic

piperazin still so much used. D. D. Stewart (Med. News, Mar. 28, '96).

A solution in alcohol and water has been applied locally to gouty joints and swellings. Ritter advises the combination of piperazin and phenocoll for the relief of gout. Piperazin in 2-per-cent. solution has been injected hypodermically, in amounts equal to 3 grains a day, for the relief of lumbago and gouty manifestations. These injections gave rise to pain, but did not cause abscesses (Heubach). Other observers have witnessed the formation of abscesses after such use and condemn it.

Allied Substances.—**LYCETOL.**—This is also known as dimethyl-piperazin tartrate; it is claimed that this substance is superior to piperazin, as the tartaric acid is supposed to be converted into carbonic acid, alkalizing the blood, and dissolving uric acid. It occurs in a fine, granular, white powder, and is soluble in water. It has a diuretic effect, an agreeable taste, and is non-hygroscopical. It may be used in gout in daily doses of 15 to 30 grains.

If the theory be correct that in gout in general there is no increased formation of uric acid, but that the blood of gouty persons is only faintly alkaline and therefore less capable of holding uric acid or its salts in solution, the administration of lycetol (the tartrate of a piperazin derivative) must produce the combined effects of its components. Lycetol also possesses the great advantages of having an agreeable taste and of being non-hygroscopical. Its aqueous solution has an agreeable acid taste, and if sugar be added it is cooling, like lemonade, and does not excite repugnance when administered for a long time. Wittzack (Allgemeine med. Central-Zeit., No. 7, '94).

LYSIDIN.—This is also known as methyl-glyoxalidin, or ethylene-ethenyl-diamin, and is obtained by dry distillation from sodium acetate with ethylene-

diamin hydrochlorate. It occurs in pinkish, hygroscopical crystals, having a mousy odor. It is readily soluble in water, and has been recommended by Ladenburg as being non-toxic, five times superior to piperazin in dissolving uric acid, and as not causing digestive troubles or albuminuria.

Lysidin tried in acute and chronic gout. It was given in daily progressive doses of $\frac{1}{4}$ to $1\frac{1}{4}$ drachms in 1 pint of gaseous water. Even concentrated solutions (1 to 100) were taken without repugnance, especially when iced. No untoward symptoms of any sort were observed, and no dislike for the medicine was expressed, even after continued use. Lysidin proved to be a powerful remedy for gout, the pain ceasing soon after its use was begun, the joints becoming supple and the tophi diminishing. E. Grawitz (Deut. med. Woch., No. 41, '94).

Literature of '96-'97-'98.

Piperazin and lysidin, as well as the ordinary alkalies, the lithium salts and sodium salicylate, do not exercise any special solvent effect upon sodium bicarbonate and their administration to gouty subjects with the object of removing uratic deposits in the joints and tissues appears to be useless, and, moreover, it is apparently contra-indicated in gout on account of its leading to an increased formation of uric acid in the kidneys. Luff (Lancet, June 11, '98).

PITYRIASIS. See DERMATITIS EXFOLIATIVA.

PIX LIQUIDA.—Pix liquida (U. S. P.), or tar, is an empyreumatic oleoresin obtained by the destructive distillation of the wood of *Pinus palustris* and of other species of *Pinus* (nat. ord., *Conifera*) of Europe and America, that coming from North Carolina and Sweden being the best. It occurs as a thick, dark, viscous mass, having a peculiar odor, contains oil of turpentine, pyrocatechin, acetic

acid, acetone, creasote, phenol, xylol, methylic acid, etc., and is blackened by wood-smoke. It is soluble in less than its own bulk of alcohol, ether, or chloroform, and is slightly soluble in the volatile and fixed oils. By distillation it yields pyroligneous acid, and an empyreumatic oil called oil of tar, which is official. Oil of tar, when fresh, is almost colorless, but with age it becomes oxidized and becomes dark-reddish brown in color; it is a volatile fluid, of acid reaction, has the odor and taste of tar, and is soluble in alcohol. The residue, after distillation, is pitch (pix solida): a black solid which has a shining surface on fracture, melts in boiling water, and consists of resin and various empyreumatic resinous products which are collectively called "pyretin." Pix solida is chiefly used in the preparation of plasters, and is entirely different from the residue of coal-tar, or "gas-pitch."

Preparations and Doses.—Pix liquida, U. S. P. (tar), $\frac{1}{2}$ to 1 drachm.

Oleum picis liquidæ, U. S. P. (oil of tar).

Syrupus picis liquidæ, U. S. P. (syrup of tar), 1 to 4 drachms.

Unguentum picis liquidæ, U. S. P. (tar, 50 per cent.).

UNOFFICIAL PREPARATIONS. — Aqua picis, G. P. (tar, 1 part; water, 4 parts), 1 to 2 pints daily.

Liquor picis alkalinus, Bulkley (tar, 2 parts; caustic potash, 1 part; water, 5 parts).

Pix saccharatum (saccharated tar; tar, 4 per cent.).

Vinum picis, N. F. (tar, 1 pint; glycerin, white wine, and honey, of each, $\frac{1}{2}$ pint; dilute acetic acid, 1 oz.; boiling water, 3 quarts), 1 to 4 ounces.

Physiological Action and Poisoning by Pix Liquida.—By reason of its irritant properties, tar may produce a papu-

lar, erythematous, rubeolous, urticarial, or acneiform eruption; the last has been called *acne piccalis* (tar-acne) by Hebra. Tar is absorbed readily, and, if a considerable area is exposed to its action, poisonous symptoms similar to those of poisoning by phenol will appear: fever, foul tongue, eructations, vomiting and diarrhœa, with epigastric pain, tarry evacuations, and severe headache or a sensation of heaviness or oppression; strangury and ischuria, with darkish urine turning almost black in color and emitting, like the stools, the odor of tar. When taken internally, tar may give rise to erythema, vesicles, or papules, accompanied by severe itching. Long-continued or large doses of tar give rise to anorexia and indigestion, depress the heart's action, and cause nervous exhaustion. A fatal case is reported by Taylor, where death was caused by the ingestion of oil of tar. Large quantities of tar have sometimes been taken with no apparent ill effect. Children and young persons, as a rule, are most susceptible.

LYSOL, a derivative of tar, caused toxic symptoms in a case reported by Reich. The application of pure lysol to a large part of the body of a young man was followed by loss of consciousness and convulsions, violent dermatitis, and the presence of albumin in the urine for two days. *Per contra*, Potjan reports a case where a drachm of lysol was swallowed without causing untoward results.

Treatment of Poisoning by Pix Liquida.—The treatment of poisoning by pix liquida is similar to that advised for poisoning by phenol. If the poisoning result from the external application of the drug, suspension of the applications may cause an abatement of the symptoms, with copious diaphoresis and more or less diuresis, the urine turning from

black to olive-green and becoming lighter in color until the normal is reached.

Therapeutics.—DISORDERS OF THE RESPIRATORY TRACT.—The vapor of tar is used largely for inhalations in diseases of the respiratory tract. In *ozæna* Moire recommends the following: Powdered camphor, $1\frac{1}{2}$ drachms; tincture of iodine, 3 drachms; iodide of potassium, 30 grains; tar, $3\frac{1}{2}$ drachms; alcohol (90°), 3 ounces; water, 6 ounces. This mixture is placed in a vessel over a water-bath, and the fumes are inhaled for two or three minutes. The nares are then cleansed by spraying with a 1-per-cent.-carbolyzed solution.

For use in pulmonary disorders with excessive secretions the tar, mixed with carbonate of potassium (24 to 1) to neutralize the pyroligneous acid, is placed in a cup over a water-bath heated by a spirit-lamp; the fumes of hot tar-water or wine of tar may be inhaled by means of a steam-atomizer; oil of tar diluted with some other oil or fluid cosmolin may be used in an atomizer; the vapor from heated tar may be inhaled. Inhalations, in any of these forms, are of value in bronchitis, especially in the subacute and chronic stages, and in winter coughs. In the bronchorrhœa of phthisis it is often useful. In connection with these inhalations tar may be given internally in the form of pills or capsules (2 grains), in milk or beer ($\frac{1}{2}$ drachm to $\frac{1}{2}$ ounce daily), or tar-water (1 to 2 pints daily), or wine of tar (1 to 4 ounces).

CATARRHIAL DISORDERS.—Tar has a specific action in common with all balsamics, not only upon the mucous membranes of the respiratory passages, but elsewhere. In health it stimulates secretion; when hypersecretion is present, tar diminishes it. Hence in addition to its

usefulness in disorders of the respiratory mucous membrane it is a valuable agent in chronic or subacute vesical, urethral, and vaginal catarrh. Injections of tar-water have given good results in chronic cystitis.

In obstinate diarrhœa H. C. Wood recommends a mixture of tar made as follows: Add a pint of tar to a gallon of lime-water, and allow this solution to stand a week, stirring it every few hours. Decant the clear liquid and percolate it through powdered wild-cherry bark, allowing 1 ounce of the bark for each pint of the liquid used. The dose is a wineglassful.

CUTANEOUS DISORDERS.—In cutaneous disorders, especially those in which the mucous layer is principally involved, tar is an effective remedy. In eczema and psoriasis the tarry preparations are very useful, and are more effective when applied directly to the diseased surface. In eczema it gives the best results when applied after the subsidence of active inflammation; if begun earlier it is apt to aggravate the disease; the indications for the use of tar is a condition of subacute inflammation accompanied by a dry, scaly surface, with more or less hyperæmia and pruritus, inflammatory products still remaining in the tissues. It is best to begin with a mild preparation: Tar ointment, 1 part; zinc ointment, 3 parts. Stronger applications may be made later. The applications of tar may be continuous or intermittent.

In the dry chronic eczema of children the following is useful: Tar, 1 part; precipitated sulphur, 1 part; zinc ointment, 16 parts. Mix and apply night and morning (Hare).

Bulkley advises liquor picis alkalinus in the treatment of chronic eczema.

For psoriasis tar may be used as a stimulant in the same manner, but it is

not so much used as formerly, having been superseded by chrysarobin.

Tar, in the form of soap, ointment, or liquor picis alkalinus (Bulkley), may be used in the treatment of scabies, tinea capitis, and lepra.

Care should always be taken in applying tar, lest it excite dermatitis or acne picealis.

In prurigo tar is often valuable. In pruritus ani a weakened tar ointment will often afford relief.

A useful application to hæmorrhoids is the following: Tar and alcôholic extract of belladonna-leaves, of each, 45 grains; glycerite of starch, 1 ounce. This is to be applied morning and evening.

Tar ointment in full strength, or modified, will be of service in lichen, comedo, sycosis, pemphigus, lupus erythematosus, and lupus vulgaris. Stern has observed that, when tar is allowed to stand in a warm place for several weeks, it separates into two layers, the upper of which is thin, syrupy, and devoid of irritant properties; an ointment prepared with this is advised when a mild effect is desired.

Derivatives and Allied Compounds.—

LYSOL.—Lysol is an antiseptic preparation made by dissolving in fat, and subsequently saponifying with alcohol, that part of tar-oil which boils between 374° and 392° F. It occurs as a clear, brown, oily-looking liquid, having a feeble, aromatic, creasote-like odor. It contains 50 per cent. of cresols, is miscible with water, forming a clear, soapy, frothing liquid. It is also soluble in alcohol, chloroform, glycerin, etc. Lysol is five times stronger than carbolic acid, and eight times less poisonous. It is used in 0.3- to 1-per-cent. solution for dressing wounds and injuries, in diphtheria, and in cutaneous disorders.

In 2- to 4-per-cent. solution it may be used for disinfecting the hands and surgical instruments. Haenle claims that it does not affect the operator's hands unpleasantly, but renders the skin soft and supple. It has also been used and recommended in gynæcology and general surgery by Cramer, Parvin, Haenle, Michelsen, etc., and in skin diseases by Unna and others (especially in lupus by Leslie Phillips). Upon mucous membranes a stronger solution than 2 per cent. should not be used. Lysol has been given internally in dyspepsia in doses of $\frac{3}{4}$ to 8 grains after meals, the taste being disguised by spirit of peppermint.

PIXOL.—This disinfectant is made by dissolving 1 pound of green soap in 3 pounds of tar, and slowly adding a solution of a little more than $3\frac{1}{2}$ ounces of either potassium or soda dissolved in 3 pints of water. This makes a syrupy fluid which in a 5-per-cent. dilution is used for disinfecting linen and the hands. Dejecta may be disinfected by using a 10-per-cent. solution, which is said to be fatal to the micro-organisms of suppuration, anthrax, cholera, and enteric fever.

PLAGUE (BUBONIC PLAGUE).

Definition.—A virulent infectious disease due to a specific organism, characterized by the formation of one or more buboes or by the development of a violent form of primary confluent pneumonia.

Varieties.—Two varieties of this disease are usually recognized: the *simple bubonic*, in which buboes appear in the femoral, inguinal, axillary, cervical, or tonsillar regions; and the *pneumonic*, in which no buboes appear on the surface, the septic process manifesting itself mainly as a septicæmia, of which the

lungs, the mesentery, the gastro-intestinal tract, the kidneys, and the brain are the main centres.

Literature of '96-'97-'98.

Reviewing the opinions expressed generally, the following appears to be a rational classification of the various forms of plague: 1. With enlarged glands (gravity according to symptoms and severity of attack). 2. Without enlarged glands (almost always fatal). Brigadier-General Gatacre (Report on Bubonic Plague, Bombay, '97).

Symptoms.—The disease is suddenly ushered in with a chill, the temperature rising somewhere between 101° and 105° F. The patient reels like a drunkard, owing to marked vertigo, and complains of violent headache and great lassitude. This sudden and early exhaustion is apparent in the features, the drooping eyelids, the apathetic air, and the evident indifference to surroundings constituting the *facies pestica* characteristic of the disease. The respiration is usually rapid, the pulse also; the conjunctivæ are congested, and keratitis, iritis, or panophthalmia are sometimes observed. The tongue is swollen, shows the impression of the teeth, and is covered with a whitish fur resembling mother-of-pearl (Bulard).

In the bubonic form the bubo appears during the first hours of the malady and is usually unique. In the order of frequency it presents itself in the groin, the axilla, or the neck. It develops with rapidity and is well advanced as early as the beginning of the second day, and is always very sensitive to the touch almost from the start. The neighboring tissues are tumefied and œdematous, especially in the parotid region. When this locality is invaded œdema of the larynx is to be feared.

On the second day the bubo is about the size of a pigeon's egg, and there is

aggravation of all the constitutional symptoms, the pulse reaching sometimes 140. Delirium now appears and the stage of apathy is replaced by one of excitement, during which the patient may try to get up. Psychological disorders become manifest, fixed ideas predominating. Functional disturbances of speech are also frequently observed. On the third day all the symptoms become still further aggravated, the pulse reaching 140 or beyond, and the bubo attains perhaps the size of a hen's egg, and suppurates. Occasionally it becomes gangrenous. Carbuncles may develop in different parts of the organism. Extensive petechiæ are usual: the "plague-spots" of older writers. Hæmorrhages from mucous membranes, the nose, the lungs, etc., are frequently observed. In some epidemics hæmorrhages are witnessed in all cases, the buboes assuming an hæmorrhagic type.

Literature of '96-'97-'98.

The most frequent form of the plague is the septic-hæmorrhagic, characterized by primary hæmorrhagic buboes, most common in the groin, axilla, or cervical region. The surrounding tissue is frequently markedly œdematous. There are numerous hæmorrhages of variable sizes in different organs. There is acute enlargement of the spleen (spleen-tumor). Various lymph-organs, the lymphatic glands, and follicles of the intestine, mouth, and also of the tonsils are more or less involved. Commission for the Study of Plague, Imperial Academy of Sciences of Vienna (*Wiener klin. Woch.*, Mar. 20, '97).

Death, in the majority of fatal cases, generally occurs about the fourth day, either from toxic paralysis of the respiratory or cardiac centres or from collapse. If the first four or five days—the acute stage—are passed safely, the chances of recovery are favorable. On the other hand, a stage of marasmus or profound

depression may appear on the fifth day and the patient succumb on the sixth. Much depends upon the condition of the heart. Some cases, especially in children, are very benign, showing but an insignificant rise in temperature, slight inguinal or axillary pain, general depression, and ephemeral torpor. Such cases, however, are apt to occur early in the course of an epidemic. On the whole, the disease shows a very high rate of mortality.

Literature of '96-'97-'98-'99.

Of 4179 patients treated for plague at hospital at Poona, India, 2836 died, the mortality being slightly greater in males than females, and distinctly lower in children. Of the fatal cases, 74 per cent. were bubonic. The non-bubonic forms, which were largely pneumonic or septic, were of the malignant class and showed high mortality,—about 75 per cent. Buboes occurred most frequently in the femoral region. The main sequels were infiltration and sloughing of the skin and necrosis of bone. Disturbance of speech was very common, particularly a peculiar drawl and inability to articulate certain words; the voice often resembled that of a boy at the age of puberty. E. L. Marsh (*Glasgow Med. Jour.*, Jan., '99).

In the pneumonic or septic variety there is profound septicæmia. The pulmonary inflammation closely resembles commencing influenza (Lewin) and does not show clear physical signs. It is a form of confluent lobar pneumonia without apparent or noticeable implication of the lymphatic system. It also begins with a chill, severe pain in the side, and more or less severe cough with rusty expectoration. The plague bacillus is always found in the latter. In this variety death may occur within twenty-four hours.

Some epidemics exhibit symptoms representing both varieties.

Diagnosis. — Characteristic symptoms were noted by Lewin during the last Bombay epidemic. The sudden exhaustion and weakness at the commencement of the disease is the first of these; no other fever, even on the first day, is characterized by such extreme debility. Neither is the moist, non-tremulous mother-of-pearl-like tongue of Bulard met with in any other disease.

Besides the typical symptoms, the bubo, and examination of the sputum for the plague bacillus in the pneumonic form, examination of the blood for bacilli, according to Abel (*Centralb. f. Bakt.*, Apr. 24, '97), is of the greatest importance. The specific organisms have been shown by Kitasato to persist in the blood for three or four weeks after the onset of the disease. Examination of the blood, however, may be fallacious, owing to variability of the bacillus, leading to confusion with other forms. The best confirmatory evidence is the result of a broth or agar cultivation. Inoculation experiments are also advisable, and, as infection is often a mixed one, the animals used should have been previously subjected to "vaccination" against streptococci. A fair quantity of blood should be used and kept at a temperature of 37° C. (98.5° F.) for ten or twelve hours before being cultivated. The urine practically always contains albumin and plague bacilli, the latter often persisting for a week after convalescence.

Plague bacilli are found in long and short forms, with an intermediate stage. Their length appears to be inversely proportional to the nutritional value of the culture-medium. The most characteristic appearance is that of sharply and repeatedly bent chains of immobile spindle-shaped bacteria, almost as small as cocci. They are decolorized by Gram's method, and with weak solutions of stain-

ing reagents show a clear space in the centre of the rod. The bacillus grows aëroically and anaëroically; it causes acid formation, but will grow in quite strongly alkaline solutions. It forms characteristic growths on agar and in bouillon. The best medium is an alkaline solution of peptone containing 1 or 2 per cent. of gelatin. It is pathogenic to all the small laboratory animals with the exception of pigeons. The micro-organism is rapidly killed by drying at a temperature of 30° C. and upward, over concentrated sulphuric acid, but is much less affected by slow desiccation at lower temperatures. Even at the room-temperature rapid drying is much more lethal to them than slow drying in tissues and fabrics.

Literature of '96-'97-'98.

Series of experimental researches to devise some rapid method of identification. This resulted in discovering that by adding to the agar-agar media an amount of salt from 2.5 to 3.5 per cent. (potassium iodide or bromide in strength of 2 per cent. is equally serviceable) and keeping the cultures in an incubator at 37° C. for twenty-four hours, peculiar characteristic involution-forms are found. In carrying out this test it seems necessary to first cultivate on ordinary agar and then transfer to the salt agar, direct inoculations from the animal body on to the salt agar failing. Hankin and Leumann (*Centralb. f. Bakt.*, No. 22, p. 438, '97).

Etiology. — Small animals, monkeys, squirrels, rats, etc., die in great numbers during epidemics of plague, rats particularly—and they seem to be first to suffer. This fact has suggested that the specific organism discovered by Kitasato, or that described by Yersin, might be of telluric origin. Whether this be the case or not, there is much evidence in favor of the contention that plague is a soil-

bred and soil-supported disease. The bacillus of plague has been found in the soil and in the dust of houses inhabited by sufferers. This micro-organism once transported to a suitable soil may there flourish and form foci of infection. According to Robert Koch (*Deut. med. Woch.*, July 14, '98), there are three endemic main plague foci in Asia: Mesopotamia, Thibet, and Assir, while he locates the primary source of the disease in the English territory of Uganda.

There does not appear to be a necessary connection between the infection of animals and outbreaks among men. Although small animals and insects, including the domestic fly and the flea, die of the disease and may spread it, it seems more logical that general insanitary conditions, enhanced by the long prevalence of drought, should tend to awaken the latent activity of the germ.

Literature of '96-'97-'98.

Experiments made upon guinea-pigs, white mice, and cats with cultures of plague bacilli gave following results: 1. The bacilli contain a poison which is very sensitive to heat, and very gradually soluble in water. Fresh forty-eight-hour-old agar cultures can be sterilized by a heat of 100° C. for half an hour, or 65° C. for one hour, or 64° C. for twenty-four hours. 2. A few weeks' old bouillon culture, kept at the temperature of the room, possesses a high degree of virulence for small animals, especially mice, and it appears that this virulence is possessed by not only the bacteria themselves, but by the excreted products of metabolism. Gottlieb Markl (*Centraltbl. f. Bakt.*, Nov. 18, 24, '98).

After the activity of the plague bacillus has reached a certain potency, through appropriate surroundings, human beings are assailed as well as the lower animals, the latter succumbing first, owing to their greater exposure to toxic germs through promiscuous feed-

ing. The tissues most vulnerable to the Kitasato bacillus are the skin and the mucous membrane, especially when these are deprived of their protective covering. Yamagiwa (*Annales de l'Inst. Pasteur*, Aug., '97) found a wound of the surface in one out of every seven cases examined. The next portal of invasion is believed by some to be the alimentary and respiratory tracts. Once beneath the surface, the bacillus is thought to penetrate the lymphatic system and thence to invade the system at large.

Literature of '96-'97-'98-'99.

The development of the bubo is one of the earliest symptoms; it precedes the profound disturbance of the nervous system. The disease originates in an "infection" through the skin, remaining localized for a time. The systemic or general infection develops from a local centre or focus of origin. Report of Austrian Plague-Commission (*Philadelphia Med. Jour.*, Jan. 28, '99).

Although all classes suffer, certain conditions of life appear to confer immunity. Persons living in-doors are more likely to suffer than those who are often exposed to the sun's rays. The boating population of China who live exclusively upon the water seldom suffer. Persons who occupy the upper stories of a dwelling are less frequently attacked than those living upon the ground-floor. The infection may be transmitted by means of body-linen, clothes, bedding, rags, bagging, carpets, etc. Foodstuffs, grain, sweetmeats, etc., are also thought capable, under suitable conditions, of transmitting infectious germs. Few nurses or attendants upon the sick are attacked if their habits are cleanly; even those whose duty includes the disinfection of infected dwellings have been free from the disease when personal cleanliness obtained. During the epidemic in Canton.

during which upward of 30,000 Chinese died, not one of the 300 American or English residents, according to the China Medical Missionary, was affected.

Pathology.—In the buboes and the glands involved Childe (Brit. Med. Jour., Sept. 24, '98) found bacilli in enormous numbers both among the cells of the gland-tissue and among the lymphatic vessels and the blood-corpuscles extravasated into the gland, as well as in the hæmorrhage outside the gland. In cases of plague-septicæmia they were similarly present in the large characteristic glands. In the kidney the bacilli could also be seen, especially among the blood-cells of the tubules into which hæmorrhage had occurred. In the spleen they were also present, among the cells of the splenic tissue and in the hæmorrhagic areas. They were present in the liver, especially in cases in which engorgement and hæmorrhage were marked. The bacilli were present in the pneumonic areas of plague-pneumonia, in profusion among the catarrhal epithelial cells and leucocytes that fill the alveoli and terminal bronchioles, as well as among the blood-corpuscles of the alveoli into which hæmorrhages occurred.

Literature of '96-'97-'98.

Large numbers of bacilli with rounded ends are found in the buboes, and also in the blood and spleen. The bacillus shows marked polar staining, but does not stain by Gram's method. It forms grayish growths on agar and light brown on gelatin, the gelatin not being liquefied. Spore-formations did not occur, and cultures are killed by exposure to a temperature of 100° C. for a few minutes or 58° C. for several hours. Rats, mice, and guinea-pigs are susceptible, and rats and mice contract the disease by feeding on cultures of the bacillus. Rats and guinea-pigs could be immunized against full virulent dose of culture of plague bacillus by single injection with a culture which had been killed by heating to

65° C. for several hours. Kolle (Deut. med. Woch., Mar. 4, '97).

Certain nuclear proteids can be obtained from the cultures of bubonic plague, which are virulent for susceptible animals and which when injected in less than lethal doses produce immunity. Alex. Lustig and G. Galliotti (Deut. med. Woch., Apr. 8, '97).

Observations conducted upon 27 patients and bodies. These revealed the presence of a bacillus corresponding to Yersin's, and therefore not to Kitasato's. It was pathogenic for mice, rats, rabbits, guinea-pigs, and cats, while dogs, fowls, and pigeons were refractory. The bacillus had but little power of resistance to antiseptics. It was killed at once by 1-in-20 carbolic acid; in 1 in 200 it survived five minutes, but after fifteen it could no longer grow on nutritive media. In 1-in-1000 sublimate solution it perished at once, in 1 in 10,000 not for five minutes. Saturated lime-water for five minutes stops its growth permanently, while sunlight kills it in less than four hours. Ogata (Centralb. f. Bakt., xxi, 20, 21, '97).

Treatment.—The medicinal treatment of plague, judging from the great mortality of that disease—80 to 90 per cent.—does not seem to merit much confidence. "A plan of treatment which succeeds in one case totally fails in another" said Gatacre in his report on the bubonic plague in Bombay of 1897. He found that calomel was largely used: an index of its general worth. Cantlie (Brit. Med. Jour., p. 249, '97) states that this agent should be given in from 5- to 10-grain doses, and be followed by a saline in some five hours' time. This experienced author recommends that from the very onset, or certainly after twenty-four or forty-eight hours, it will be found necessary to stimulate the patient by food, alcohol, or medicine. Food should be given in small quantities, frequently repeated, and of a kind which is easily digested. Essence of beef, in fluid or jelly

form, is recommended. Ox-tail soup, mutton-broth, beef-tea, and chicken-tea are also useful. Milk with ice, sipped slowly, and ice-cream are particularly grateful. Thirst is a marked symptom, and ice to suck, if not kept up too long, water or lemon and water (not lemonade) to drink, iced beer and stout, brandy, or whisky diluted with three or four times its quantity of water (not aerated waters) may all be used. When the pulse shows signs of failing or collapse or faintness supervenes, alcohol is beneficial, and brandy is preferable to whisky. Cantlie found that active delirium is best controlled by cold to the head: Leiter's coils, ice-bag, or wet cloth. Hyoscine in $\frac{1}{100}$ -grain dose hypodermically is the most efficient and safe of the hypnotics. Morphine, in $\frac{1}{8}$ - to $\frac{1}{4}$ -grain dose subcutaneously in combination with atropine, is most useful when painful adenitis complicates the cerebral intoxication. Diarrhœa may be treated by salol in 10-grain doses, or by a suppository of morphine, $\frac{1}{4}$ grain; and cocaine, $\frac{1}{2}$ grain. Vomiting may be controlled by a mustard-plaster to the epigastrium, ice to suck, and an effervescent draught of a few drops of hydrocyanic acid and solution of morphine. For pyrexia Cantlie contends that chemical antipyretics should not be used. Frequent sponging with tepid water, ice to the head and nape of the neck, iced drinks, and a short application of the wet pack, with the administration of brandy by the mouth or rectum. Smelling-salts and strong ammonia to the nostrils often arouse a patient in collapse and permanently revive those apparently moribund. Hypodermic injections of ether must be used frequently and freely. Internally, ammonium carbonate in a tincture or decoction of cinchona is most useful, while digitalis and strophanthus are unsatisfactory.

Camphor, either hypodermically in sterilized oil or as a 2-grain pill, is a direct stimulant and a stomachic carminative. Musk may be given in 5-grain doses every six hours. Strychnine sulphate in $\frac{1}{48}$ -grain dose hypodermically in 10 minims of distilled water is valuable. Inhalations of oxygen are also recommended. Abscesses should be opened when they point.

SEROTHERAPY.—Serotherapy has not as yet shown results warranting any conclusion as to its real merits. While Yersin's serum, according to Arnold (*Med. News*, Jan. 1, '98), reduced the mortality of severe cases from 80 or 90 to 50 per cent. and that of mild cases from 50 to 10 per cent., other observers, Clemow (*London Lancet*, May 6, '99), for instance, do not credit it with beneficial powers. This serum is prepared as follows: The subcutaneous injection into horses of a fresh plague-bacillus culture upon agar giving rise to a severe local swelling, ephemeral fever, and an abscess, Yersin resorts to venous inoculation, and thus avoids the abscess-formation. Violent reaction follows these injections until, after repeated and stronger doses, immunization is accomplished. Three weeks after the last injection a serum is obtained by venesection that may be used therapeutically. It is important to remember, however, that this serum does not long retain its activity (E. Roux).

Prophylaxis.—The prophylactic measures indicated consist, first, of vigorous efforts calculated to antagonize unhygienic conditions, and, second, of preventive inoculations. J. M. Atkinson concludes that, the occurrence of plague being favored by the absence of sunshine and general insanitary conditions, such as obstruction to the free access of light and air to domestic dwellings, the steps to be taken to retard the progress of the

disease are (a) general cleanliness and the free admission of light and air to domestic dwellings; (b) the immediate isolation of the sick and those who have been in close contact with the disease; (c) the careful and systematic disinfection of all premises in which cases occur and of latrines.

As to the best methods of disinfection, an exhaustive investigation led Abel (*Centralb. f. Bakt.*, Apr. 24, '97) to conclude that moist heat—i.e., steam—was the most efficacious. Of chemical reagents, the best were 1-in-1000 sublimate in carbol-sulphuric acid, lysol, and chloride of lime in 1-per-cent. solution. Carbolic acid proved useless in less than 5-per-cent. strength.

Schultz (*Archives des Scien. Biol. de l'Inst. Impér. de Méd. Expér. à St. Petersbourg*, tome vi. No. 5, '98) found that perchloride of mercury has a most powerful action in destroying the plague bacillus, but its strength depends on the medium in which the bacilli are contained. To disinfect clothes, etc., they must be thoroughly soaked with the perchloride solution, which fact does away with its practical usefulness to a large extent. The addition of hydrochloric acid increases its disinfecting action. Though formalin in solution is 20 times less powerful than perchloride of mercury, in the form of gas it becomes a most reliable disinfectant, and is deemed the best for furniture, clothes, etc., especially as it injures them in no way.

Literature of '96-'97-'98-'99.

Experiments showing that the duration of vitality of the plague bacillus in the bodies of buried animals continues from twenty-two to thirty days. Yokote (*Centralb. f. Bakt.*, xxiii, p. 1030, '98).

Cases of plague should be immediately isolated; the sputum, urine, and excreta should be received in vessels containing mercuric chloride of the strength of 1

part in 500, while a solution of half this strength should be used for soaking soiled clothes, disinfecting cups, spoons, etc., and washing the physicians' and attendants' hands. No infected matter should be thrown into the drains on account of the likelihood of infecting rats in the sewers. If patients die, they should be wrapped in sheets soaked in strong bichloride solution, and the body be surrounded in the coffin by carbolized sawdust. W. J. Simpson (*Brit. Med. Jour.*, Sept. 16, '99).

The prophylactic fluid of Haffkine has been extensively used, apparently with encouraging results. In its preparation a luxurious crop of plague organisms is cultivated by adding to the nutritive media abundant quantities of fat exposed to free aëration. The fat used is clarified butter, which is suspended on the surface of the nutritious fluids. When the fluid is filled with a rich jungle of stalactites, the growth is shaken off from the drops of butter and brought down to the bottom of the liquid, leaving the butter on the surface free to produce a second crop of growth. In the course of a month, half a dozen successive crops are thus obtained, which fill the liquid, when shaken, with an opaque, milky emulsion. The micro-organisms in this fluid are killed by exposing them for one hour to a temperature of 70° C. In a quiet position in test-tubes two different substances are then obtained: a thick white sediment and a perfectly limpid fluid. Injected subcutaneously into animals they produce: (1) the sediment,—a local inflammation, and a nodule at the seat of inoculation, accompanied by little fever or general effect; and (2) the fluid,—a considerable rise of temperature, and a general affection, with no noticeable local effects. (Haffkine.)

The injection of 3 cubic centimetres of prophylactic seems to be sufficient to effect the desired protection. It cannot

arrest symptoms already started or that show themselves within a few hours, but the time necessary for it to produce the protective effect is very short.

Literature of '96-'97-'98-'99.

Haffkine's prophylactic against plague is found to reduce liability to attack 75 per cent. Editorial (Indian Lancet, Nov. 16, '97).

Epidemic of plague in Lower Damaun stated to be one of the most virulent observed in India. Inoculations tried on a large scale. Results are estimated on the 2189 authenticated deaths, thus avoiding any possibility of exaggerating the power of the prophylactic. Altogether, 2297 persons were at different times inoculated. Between March 26th and the end of May 6033 uninoculated had 1482 deaths; that is, 24.6 per cent.; while 2297 inoculated had 36 deaths, or 1.6 per cent. With the same death-rate as the uninoculated the inoculated should have had 332 deaths instead of 36, which represents a difference in mortality of 89.2 per cent.

In a careful analysis of the results of the inoculation it is shown that the efficacy of the prophylactic depends on the virulence of the microbe from which the lymph is prepared, and on the dose and its powers of producing a well-marked febrile reaction, and that it is more effective in preventing deaths than attacks. M. W. M. Haffkine and Lyons (Brit. Med. Jour., Jan. 8, '98).

In Hubli, India, from May 11th to August 23d, 33,880 persons were inoculated (24,138 twice, 9742 once). In all, 58,018 inoculations were performed in fifteen weeks. Actual plague deaths have averaged 85 per cent. in favor of the inoculated. Haffkine's inoculation method and sanitation and hygiene should be utilized together. The general health of the inoculated persons seems to be improved, as shown by the lower death-rate from "other causes." Leumann (Lancet, 10, '99).

PLASTIC SURGERY.—Plastic surgery includes the various measures required to correct malformations due to

defective embryonal development,—harelip, cleft palate, branchial fistula, and kindred conditions,—and deformities occurring as the result of cicatricial contraction after burns, ulcers, or other destructive agencies and disorders. Although plastic operations upon tendons, nerves, and bones are usually included under this head, it has been deemed more advantageous to the reader to consider the subjects in articles upon the various conditions in which such measures are indicated.

Plastic surgery (anaplasty) should not be confused with skin-grafting (transplantation). The former is limited to operations where the cuticle is merely loosened from the underlying tissues and slid from one point to another, or where pedunculated flaps are employed, while the latter refers to operations in which portions of skin are entirely severed from their original connections and used to fill defects elsewhere. The word *flap* should be confined to plastic surgery, and the word *graft* to transplantation.

General Considerations.—In repairing defects the neighboring skin can generally be employed by merely stretching it, or by cutting more or less definite flaps and shoving them from one point to another. Occasionally it is desirable to use flaps with pedicles, obtaining them from the vicinity ("Indian method"), or from an extremity which can be approximated to the seat of operation and held there until union has taken place ("Italian method"). The pedicle is subsequently severed. Considerable twisting of the pedicle is often necessary. Frequently the skin must be extensively undermined in order to increase its mobility.

The applications of plastic surgery are exceedingly numerous. A crural ulcer, for instance, may be covered by a pedun-

culated flap from the other leg, the limbs being appropriately bound together during the process of healing; the cuticle of the hand may be replaced by flaps from the anterior or posterior surface of the trunk, the skin being sometimes elevated into a bridge and the hand slipped beneath; defects in the urethra and exstrophy of the bladder can be repaired with flaps from the scrotum or other adjacent parts; and some of the neatest plastic work is done in connection with cleft palate and repair of the perineum.

Double flaps are sometimes useful. For instance, if a single flap is turned from the neck into a total defect of the cheek, the raw side next the buccal cavity will cicatrize and contract, causing much deformity. This can be avoided by using two flaps with their raw sides together: one from the neck and one from the scalp, the hair of the head simulating a beard. In some operations it may be advantageous to permit the two flaps to grow together before placing them in position; or the raw surface of a flap may be skin-grafted either before or after sewing it in place. Flaps may be bent upon themselves, rendering them thicker and supplying them with a cuticular covering on both sides; but this requires the sacrifice of so much skin from one region that it is seldom resorted to.

Flaps composed of skin and periosteum, or skin, periosteum, and bone, in undisturbed relation to one another, are often of service. They may be cut and chiseled from adjacent parts and employed to fill defects in bone—about the skull, for instance, or following operations for osteomyelitis of the tibia. König employs, in rhinoplastic work, skin-periosteal-bone flaps obtained from the forehead. Occasionally it is possible to chisel off a flake of bone through a

small incision, without cutting a flap at all, and slide it from one spot to another by means of its loose areolar-tissue connections with the skin.

General Technique.—Asepsis is of prime importance. The avoidance of suppuration diminishes the size of the scar and the amount of cicatricial contraction, and there is less tendency to the cutting of sutures.

It should not be lost sight of that it may be preferable to cover defects with skin-grafts rather than to attempt extraordinary feats of plastic surgery. Especially is this true of raw surfaces from which flaps have been obtained.

Tension should be avoided as far as possible, relaxation sutures often being of utility in this regard. No more sutures should be employed than are really necessary, and they should be just tight enough to draw the parts together and no tighter.

In cutting flaps, about one-third should be allowed for shrinkage.

Care must be used in twisting pedicles not to cut off the vascular supply from the body of the flap. When it is possible to include a blood-vessel in the pedicle, this should be done. The bruising of flaps or their excessive handling must be avoided.

A certain amount of pressure on the part of the dressings is often advantageous, but it should not be great enough to endanger the free circulation of fluids.

Artificial warmth, in the shape of fomentations, poultices, etc., is apt to do more harm than good, and is, in general, unnecessary.

Oozing must be carefully checked, preferably without the use of ligatures. An accumulation of blood beneath a flap may seriously jeopard the success of an operation.

Hairs are readily transplanted in flaps comprising the entire thickness of the skin. This may be taken advantage of, for instance, in replacing portions of the bearded cheek from the scalp.

It is important to remember that puckers and irregularities following a plastic operation tend to smooth themselves out to a considerable extent, and what seems to be at first rather a rough piece of work may eventually become presentable. This should be no excuse, however, for careless or unsightly surgery.

Moderate discoloration of flaps, or the appearance of blisters, may mean superficial necrosis only, and not complete death of the flap.

In plastic surgery, dry dressings are generally preferable to moist ones.

When pedunculated flaps are used, the pedicle should not be cut until definite healing has taken place and the circulation has become thoroughly established. This may require two or three weeks. Even then it is usually better to wait until the tissues have contracted and smoothed themselves out as much as possible before removing the unsightly hump sometimes resulting from a twisted pedicle. It is surprising how much "time" will often accomplish. (LEONARD FREEMAN, Assoc. Ed.)

Deformities of the Lips.

Harelip.—This common deformity is due to the non-union of the mesial nasal process with the superior maxillary process. It may assume various forms: (*a*) a mere notch in the red edge of the lip; (*b*) a cleft through the soft portion of the upper lip only; (*c*) a cleft through the lip and nostril and accompanied by cleft palate; (*d*) double harelip with a floating intermaxillary bone and cleft palate, a variety witnessed in one-tenth of all cases (F. J. Shepherd, Montreal

Med. Jour., Jan., '99). In the latter case the intermaxillary bones usually project and are either covered by skin or connected with the nasal septum, projecting sometimes as far as the tip of the nose. When the cleft extends into the nose there is always a simultaneous defect in the alveolar border generally involving separation of the middle and lateral incisor teeth. Other deformities of the face, also due to defective development, are sometimes present besides harelip: congenital fissure of the cheek, eyelid, etc. Single harelip occurs most frequently on the left side. It is often traceable to heredity.

Treatment.—Operative procedures are obviously alone of value; but the age at which these should be resorted to has given rise to considerable discussion: a fact tending to show that a fixed time, —the sixth week, the third month, etc., —as recommended by various operators, cannot be adjusted to all cases. Indeed, the resisting powers of the child are of primary importance; for, while one may easily stand the operation a few weeks after birth, another will die from shock. Doubtless the best age for operation for harelip depends on the condition of the child and the character of the deformity; should the deformity involve only the soft parts and the child be healthy, Shepherd contends that one should operate at once. In simpler cases the earlier the operation, the better. Should the child be weakly, or the fissure be double and extend through the hard parts, then the operation ought to be postponed some weeks or even months. From six weeks to three months is probably the proper time for operating.

The following technique is that recommended by Shepherd: Chloroform is the best anaesthetic. The child should be wrapped in a sheet or large towel, so

that the arms may be confined, and then held in the arms of a strong nurse. Sitting in front of the patient, the operator should first cut through the mucous membrane attaching the lip to the gum, and freely separate it so that the lips hang loosely. The edges of the cleft are then freely pared by using a narrow-bladed knife and transfixing the edge of the cleft well up to the nostril; the flap is cut free above, but below it is left on each side attached to the edge. As the two edges of the cleft are seldom the same length, one being usually distinctly longer than the other, on the longer side the soft parts should be more freely freshened. Both flaps should be cut as far as the red line of the lips. Any redundancy can be cut off without any trouble. The flaps should not be separated from the edges of the cleft below until several sutures have been placed in the lip above and the fastened edges of the cleft accurately adjusted near the nose. The paring from the shorter side is then cut away, and more or less, as occasion requires, of the tissue at the red portion of the lip removed; the flap of the long side is brought over as before, and adjusted as accurately as possible. During the operation an assistant compresses the sides of the cleft with his fingers. Should any blood get into the mouth, it must be at once removed with sponges on handles. Silk-worm-gut and horse-hair sutures are employed. Care should be taken not to go through the lip while suturing, but to dip down to the mucous membrane only; the stitches should range on each side at least one-eighth of an inch from the edge. If the sutures have not been satisfactorily placed or seem to pull too much, or if there is a slight unevenness, one should immediately take them out and reintroduce them. After the main

sutures of silk-worm gut are placed, intermediate ones of horse-hair may be employed, and afterward the lip everted, and the mucous membrane sutured in the mouth. He states that the most important points to be observed in the operation are: 1. Freeing the lip from the gum. 2. A free sacrifice of the edge of the cleft. 3. Accurate apposition of the parts.

In dressing, an antiseptic paint (iodoform, resin, oil, and alcohol) applied over a piece of lint or cotton is used. If the usual cheek-straps are applied to preserve tension, they should be made of diachylon plaster, and the cheek parts cut broader than the part running across the lip; they should interlace in the middle line, the cheeks being well pulled forward.

Zinc-paste dressing for harelip recommended as superior to others as to simplicity, convenience, and mechanical and antiseptic effects. This paste, first described by Socin in 1813, consists of zinc oxide, 50 parts; zinc chloride, 5 to 6 parts; water, 50 parts. After completing the operation, the suture-line is disinfected and carefully dried. The paste, freshly prepared, is applied over the whole upper lip with a brush or spatula, with one or two very thin layers of cotton for support. If the wound extends into the nostril, the paste should cover it throughout its extent, but without blocking the nostril. It dries rapidly and forms an air-tight, firmly-adherent covering, over which the nasal secretions run without dissolving it. It is non-irritating. The dressing is changed on the fourth to sixth day for removal of sutures. If not already loose, it can be slowly cut away with scissors. A fresh dressing is then applied, which is allowed to remain till separated spontaneously. Van Noorden (*Beit. zur klin. Chir.*, B. 4, H. 2, '89).

Before operation it is very important to know that the child has not been exposed to any fevers, measles, or scarla-

tina. This is the one cause of failure. Another is the inordinate crying of the child, and also the too-early removal of the stitches. Sepsis is the great cause of failure; sutures should not be removed too soon. Silk-worm gut is left in from six to ten days. Should primary union not occur, one should wait until the inflammatory action has subsided, and then freshen the edges and bring them together. After the operation there is often great difficulty in breathing through the nostrils, and rubber tubes introduced are often a great aid and prevent collapse of the nostrils.

It is advantageous to introduce a prophylactic suture before the freshening of the edges of the cleft is begun, so that the moment the dissection is ended the raw surfaces are brought in confrontation and the bleeding completely suppressed. Carl Beck (*Med. Monats.*, Apr. 3, '90).

Literature of '96-'97-'98.

Important points in the treatment of harelip include the following considerations: 1. Harelip babies are not necessarily feeble at birth, and by proper feeding can be kept up to the normal standard. 2. The field should be kept clean with aseptic washes before the operation. 3. One should operate in the sixth to the eighth week. 4. One should not slash with scissors, but cut and trim carefully with a knife. 5. The upper lip should be freed thoroughly from the jaw. 6. The nares should be anchored with shotted wire. 7. No pins or heavy outside sutures are to be used. 8. Crêpe lisse, not surgeon's plaster, is to be used. 9. The heavy inside stitches are to be left for six days. 10. After operation special attention should be given to the care of the bowels and to proper feeding, as on this very often hangs the whole success of the operation. Mumford (*Boston Med. and Surg. Jour.*, Mar. 3, '98).

In double harelip, when there is no projecting intermaxillary process, all the

mucous membrane from the central portion is cut away and the flaps taken from the sides of the cleft as in single harelip; the central portion is sutured on each side to the lateral clefts, and the lateral flaps run across to meet each other below the central portion, the lower part of which is freshened. What is in excess is cut away. Sometimes the central portion may be cut into the shape of a V and the lateral flaps adjusted to it. Where the intermaxillary bone projects the case is more difficult. In some cases, such as where the bone grows from the tip of the nose, it must be sacrificed, but it can be broken back and forced into the cleft. Sometimes it is necessary to pare the edges of the gums, and in some cases the bone is kept in position with wire or silk sutures. One should always try and save the intermaxillary bone.

In double harelip, where the prolabium has to be utilized as a column for the nose, the case resolves itself into one of single harelip with a very wide cleft. But where the prolabium can be utilized in the lip, it is pared on its three sides (all the red being removed) and inserted between the apposed sides of the cleft, its lower border being united to the upper surface of the flap as the latter passes beneath it to reach the notch prepared for it on the opposite side of the lip. C. H. Golding-Bird (*Brit. Med. Jour.*, Oct. 25, '90).

When necessary, the entrance of blood into the air-passages may be prevented by placing the child in the Trendelenburg position, or holding it upright with the head inclined forward. The effects of hæmorrhage and shock may be combated with subcutaneous injections of large quantities of normal salt solution.

Hypertrophy of the Lips.—Undue thickness of one or both lips is occasionally observed in healthy individuals, but more frequently in strumous children. When the hypertrophy is sufficiently

marked to disfigure the patient, operative procedures must be resorted to. The deformity is usually corrected by removing an elliptical piece of the mucous membrane and submucous tissue in a horizontal direction. The edges readily heal together. The tissue removed should represent the excess only, removal of an excessive mass being followed by disfigurement due to undue recession.

DEFORMITIES DUE TO INJURY.—Burns and scalds are the most prolific causes of labial deformities, ectropion or eversion of the lip being caused by the subsequent cicatricial contraction. The lower lip is usually that involved, and the exposure of the teeth and gums, the interference with speech, and the dribbling of saliva give the patient a repulsive appearance. This is especially the case when the injury involves the tissues of the chin and neck: the lip may then be drawn over the chin and the latter down to the interclavicular notch or even to the sternum proper.

TREATMENT.—The method recommended by Mr. Teale, of Leeds, is usually resorted to, and is performed as follows: "The everted lip is divided into three parts by two vertical incisions three-fourths of an inch long and carried down to the bone. These incisions are so planned that the middle portion between them occupies one-half the lip. From the inner end of each incision the knife is carried upward to a point one inch beyond the angle of the mouth. The two flaps thus marked out are freely and deeply dissected up. The lateral flaps are now raised and united by twisted sutures in the mesial line and supported as on a base, by the middle flap, to which they are also attached by a few points of suture, leaving a triangular even surface to granulate." This operation usually gives good results, but it must some-

times be slightly modified to suit the existing conditions.

Excision of Labial Malignant Growths.—The operation is an easy one, a V-incision, including all the mass and brought together with harelip-pins or deep sutures of silk-worm gut, constituting, as a rule, the only procedure required. The wound, properly dressed, usually heals in a week. When the growth has progressed further, all diseased tissues—always including all enlarged glands—should be removed; the operation is necessarily more extensive and perforce less promising. A plastic operation should be subsequently resorted to to form a new lip.

Fricke urges that every ulcerating wart about the lips which resists treatment should be promptly extirpated under local anæsthesia by means of a pair of scissors. When the growth has progressed beyond this stage, every anatomically-related lymphatic gland which is placed in its typical position must be removed. If the glands are not perceptibly enlarged, they are taken out with the surrounding fat. First the glands, then the tumor, is extirpated. This sequence is important. As a rule, the incision should be carried two-fifths of an inch wide of all obviously affected tissue. There were only 3 cases of local recurrence out of 113 operations in which this rule was followed.

When the edges of the new lip are devoid of mucous membrane, the mucosa may sometimes be pulled over the defect from within and stitched to the skin. It should not be forgotten that a lip formed of skin alone, with no internal mucous covering, will shrink enormously when cicatrization takes place.

Macrostoma (Large Mouth).—This is a deformity of the mouth due to failure of the maxillary process to unite with

the mandibular process during development. As a result, the slit constituting the mouth is not central, and may be prolonged on the one side of the face so as almost to reach the ear. This condition is often associated with malformation of the auricle.

TREATMENT.—The edges of the buccal opening may be freshened and united, leaving enough of the aperture to constitute a normal mouth. The latter must not be made too small, however, the patient having to undergo a gradual training in the use of the lips in speaking, drinking, etc. In some cases a plastic operation is required.

Cleft Palate.—This condition is the result of imperfect union, during foetal life, of the two horizontal septa which, by their growth, form the partition between the nasal cavities and the mouth. When the posterior portions of the processes fail to coalesce, the resulting triangular slit forms the "cleft."

The extent of the opening varies from a small slit merely separating the uvula into two halves (bifid uvula) to complete central division of the soft and hard palates. In many cases of the latter kind the margin of one of the maxillary processes is fused with the vomer. It may also be associated with harelip on one or both sides, the intermaxillary portion, in the latter case, carrying two or three incisors.

The condition, as is well known, interferes more or less with voice-production, owing to the escape of air into the nasal cavities, and with deglutition, food being sometimes forced into the post-nasal space. During infancy this sometimes represents a dangerous feature, the infant being unable to suck satisfactorily, owing to the inability of the soft palate to close off the naso-oral isthmus during deglutition.

TREATMENT.—The time at which operative procedures should be resorted to depends upon the condition of the child, the extent of the deformity, and the degree of interference with normal feeding. In inextensive clefts the child soon adjust the soft tissues of the mouth to the existing malformation, and finally swallows sufficient food; but an early operation is indicated to avoid imperfect enunciation when he begins to speak. In England it is customary to operate about the fifth or sixth year; in America about the third.

When the child is strong and well nourished, an effort should be made at closing the palate long before the time laid down as proper by the majority of surgeons. Hæmorrhage in these young children is always slight, and is easily arrested; the stripping of the mucous membrane, with its underlying periosteum, is easy; the vitality of the flaps is distinctly greater than at a more advanced age, and adhesions between the sutured surfaces is much more likely to take place. Debove (*Lyon Méd.*, vol. lxx, '92).

When interference with deglutition is such as to prevent proper feeding of infants, Mansell-Moullin recommends that a flap be adjusted to the rubber nipple so disposed as to close the cleft when the child has it in his mouth, or if the nipple be long that the opening be on its under surface. The physiological function of the soft palate is thus replaced and the child properly nourished until the operation can be performed.

STAPHYLORRHAPHY.—This operation is somewhat tedious, owing to the difficulty of reaching the parts. The patient should be anaesthetized and the mouth kept open by means of a mouth-gag. Both sides of the soft palate are, in turn, seized with a tenaculum forceps

and their edges pared off with a very sharp probe-pointed bistoury. Curved needles held in needle-forceps are then used to introduce the sutures, the best of which is silk-worm gut. Some surgeons prefer silver wire and use tubular needles. The needle is introduced on either side from below, the sutures being made double on one side and single on the other. The latter being passed through the former, the stitches are tied, after the pared edges have been carefully brought in apposition, just enough to insure union. An important point now is to ascertain whether the parts are under tension. If they are not, the operation proper is finished; if they are, a procedure introduced by J. Mason Warren should be resorted to: *i.e.*, the levator and tensor palati muscles should be divided by pushing a tenotomy-knife through the soft palate, immediately internal to the hamular process and cutting upward until the muscles are severed. The brisk hæmorrhage caused usually soon stops of its own accord. The head may be turned to one side and the mouth swabbed out with ice-water. Blood should not be allowed to trickle down into the larynx.

As soon as the operation is finished the parts should be carefully cleansed by irrigation with boric-acid solution. Only tepid and liquid food should be allowed the first few days and soft food subsequently until adhesion is complete. This occurs in a healthy child at the end of a week, when the stitches may be removed, but it is better and often necessary to leave them longer.

When a small portion of the wound fails to heal, it should be stimulated with the mitigated stick (nitrate of silver and oxide of zinc).

Polaillon performs staphylorrhaphy in two sittings, an interval of twenty-four

to forty-eight hours being allowed between the two stages. At the first sitting the usual lateral incisions are made on both sides; the mucous membrane is dissected from each side and loosened from the palatal bones; then hæmorrhage is arrested by compression or hæmostatic forceps. At the second sitting, the edges of the tissues are vivified and very fine sutures introduced. This operation may be done under cocaine anæsthesia.

Owen detaches the muco-periosteum from the back of the hard palate, in order to gain a slackness of tissue at the anterior part of the cleft in the velum. Tension is further diminished by lateral incisions passing through the soft palate parallel to the line of the sutures.

URANOPLASTY.—When the hard palate is involved the operative technique is somewhat more complicated. If the hard palate alone is fissured, the old procedure advised by J. Mason Warren is still resorted to by most surgeons. It consists in carefully separating the mucous membrane and periosteum from the bone on both sides with the palate-elevator, beginning at the margin of the cleft and extending on each side toward the alveolar process as far as needed. The vessels in the palatine canals must be avoided. The free flaps of membrane thus obtained are then brought together over the opening and sutured. When the soft palate is also cleft, it should be cut from the horizontal edge of the hard palate and the edges of the fissures pared and united precisely as in staphylorrhaphy, including the section of the palatal muscles if required. Sutures are then introduced, the first being inserted at the junction of the hard and soft palate after the flaps have been carefully adjusted in their new position. In some cases—those in which the fissure is not

wide—the separation of the soft palate from the hard palate is not required; both edges of the entire fissure are pared, the membrane over the hard palate is raised, and the entire opening is closed by approximating the pared edges and suturing them. The subsequent measures are the same as in staphylorrhaphy.

Ferguson modified the operation by dividing the bone itself on either side of the fissure and forcing each fragment thus obtained toward the median line. The edges of the fissure are first freshened; holes are drilled through the bony processes near the edge and silver sutures are passed through the openings; a strip of bone is then cut off with a chisel or saw from each side and pressed over to the median line. The sutures are then drawn together and tied. Division of the soft palate downward is necessary. This operation has not obtained much favor among surgeons, though it is a satisfactory one.

A feature of these operations is that much hæmorrhage usually occurs. This can be, in part, prevented, however, by pressing upon the tissues behind the upper incisors: a rather inconvenient procedure. When the periosteum is raised the bleeding is especially profuse, but pressing of the flap against the bone with a sponge arrests it. The descending palatine arteries can be plugged, as shown by Marsh.

In some cases operative procedures cannot be resorted to; obturators constructed by dentists should then be tried.

Rhinoplasty.—Plastic operations are often indicated for deformities of the nose due to the destructive influence of various diseases: syphilis, lupus, or traumatism. Occasionally the entire organ has been lost, leaving an unsightly opening; in others the cavities are only partly exposed, through partial destruc-

tion of the alæ; while, in others, again, the organ is flattened out or its bridge is on a level with the cheeks: the so-called “saddle-nose.” Two main methods are at our disposal to remedy extensive destruction of the soft parts: the Indian and the Italian, proposed by Tagliacozzi.

INDIAN METHOD.—In this procedure a pear-shaped flap, somewhat larger than needed to make up the aggregate of soft tissues that would represent a normal nose, is mapped out on the forehead. The flap should lean somewhat toward one of the eyebrows, the narrow portion corresponding to the root of the nose and forming a pedicle one-half inch wide. This being done, the edges of the nasal opening are carefully freshened and leveled, a regular bed being prepared for the flap which is to cover it. The pear-shaped flap is then carefully detached with the periosteum from the frontal bone, twisted down around its pedicle, adjusted to the freshened tissues around the nasal orifice, and so adjusted as to cause a bend in the flap to correspond with what would represent a nasal bridge. Two hard-rubber tubes shaped like the anterior nares should be inserted under the flap so as to preserve patency, and the flap sutured in place. The objection to this operation is that it leaves a scar.

Schimmelbusch, recognizing that only partial cosmetic and functional results are secured in the operation, for the reason that for want of support the new nose gradually sinks and then more and more shrinks, resorts to the following operation: A three-cornered skin-and-bone flap is taken from the middle of the forehead. This flap is so cut out with the knife that the smaller base is at the root of the nose, and the broader side lies exactly in the middle of the forehead. With a sharp, broad chisel

the anterior surface of the frontal bone represented by the flap is chiseled off. From the angles of the forehead-defect, large, arched incisions are carried over the skull toward the ears, and the flaps loosened and sutured over the forehead. In this manner simple linear scars remain in the forehead. The loosened flap must first be allowed to granulate, and then it is transplanted upon the wound-surface. The bone-plate is sawed along its middle line and folded together in the form of the nose. This formed flap is then sutured into the freshened wound in such a way that the raw surface stands posteriorly and the skin-surface anteriorly. The septum of the nose is simply obtained from the skin in the deformed nose; so that strips of skin are taken from the sides of the defect as far as the natural position of the septum. The tip of the nose is also formed from the original nose. The first week a silver wire with buttons on either end is passed through the nose at the level of the alæ, and left in place until the separation of the forehead flap and the end of the operation. This helps form the configuration of the alæ by its lateral pressure.

ITALIAN METHOD.—The Italian method consists in utilizing a flap taken from the arm of the patient, over the biceps, at a spot corresponding with the nose when the hand is applied over the head from the front. The flap is so shaped as to assume that of the nose when *in situ*, an allowance of one-third being allowed all around it for shrinkage. It is detached from the arm only partly, however, a pedicle being preserved to insure nutrition of the separated tissues. The flap is left in this condition about two weeks, in order to enable it to become vascular and covered with granulations underneath. At the

end of this time the nasal orifice is prepared as for the Indian method; the forearm is placed over the head and fastened there by bandages, and the flap is adjusted to the pared nasal edges and sutured. The patient must remain in this trying position about twelve days, when, the flap having become adherent, the pedicle may be cut and the arm released. The pedicle is then trimmed off to give it a shapely appearance, and a column is either formed with it or with a small flap taken from the upper lip. The procedure is often successful, but its irksomeness, and the fact that a presentable nose is seldom obtained, cause it to be seldom employed.

In the less marked deformities of the nose, which usually affect the alæ, a small flap may usually be obtained from the cheek, or from the forehead if a large one is necessary. A pedicle should always be left to insure nutrition of the flap while it is becoming adherent to the tissues over which it is applied. If the redundant portion due to the pedicle is in any way unsightly, it may be surgically adjusted as soon as the nasal flap is thoroughly nourished through its new channels. (See SKIN-GRAFTING, vol. vi.)

PLEURA, DISEASES OF. (See also PLEURISY.)

Pneumothorax (Hydropneumothorax; Pyopneumothorax).

Definition.—Air in the pleural cavity is designated pneumothorax. With rare exceptions, fluid, either serous or purulent, is also present; hence the terms hydropneumothorax and pyopneumothorax.

Symptoms.—In the majority of cases the onset is sudden and markedly severe: pain in upper part of the chest, an agonizing feeling of want of breath, rapid feeble pulse, and some cyanosis. The

patient may have a sensation of something's having given way and of fluid's trickling down inside the chest. Any or all these symptoms may be absent. The severity of these symptoms depends chiefly on the functional activity of the lung affected and on the rapidity of the escape of air into the pleural cavity.

If the perforated lung has performed the greater part in respiration the distress will be extreme and death quickly follow; but if it has previously been much diseased and restricted in function, its loss will be but little felt, if at all perceived. If the escape of air into the pleural cavity is rapid, the urgency of dyspnoea will be much increased, especially if the perforation is valvular, preventing the return of the air into the bronchus and thus increasing the pressure effect of the escaped air.

In advanced phthisis, in which general debility is marked, the respiratory needs are small. In such cases perforation may pass unnoticed, an unsuspected pneumothorax being found at the post-mortem examination. Pain is the most constant symptom in such cases, but it is apt to be attributed to a simple localized pleurisy which occurs very frequently in these cases. This indicates the necessity for careful examination to discover the cause of such attacks of pain in chronic pulmonary phthisis.

As the shock effects pass off the patient may become comfortable, although the respiration continues rapid and may increase in frequency as the air and pleural effusion increase in the pleura. As in tuberculous disease of the lungs, so here, the patient may be breathing fifty times or more to the minute and yet make no complaint of dyspnoea.

In marked cases, especially with increased intrapleural tension, the physical signs are very distinctive.

INSPECTION.—The affected side is large and motionless. The intercostal spaces are obliterated; the cardiac impulse, if visible, is much displaced. The respiratory movements of the opposite side are exaggerated.

Literature of '96-'97-'98.

By examination of rabbits and dogs in which an artificial pneumothorax had been produced, the blood in the carotid artery was found to contain only half as much oxygen as normal and it is believed that this diminution of oxygen accounts for the increased respiratory activity. Sackur (*Zeit. f. klin. Med.*, B. 29, '96).

Vocal thrill is absent unless over the site of adhesions of the lung to the chest-wall. The cardiac impulse may be more accurately determined than by inspection. The liver may be found much displaced downward, especially in right-sided pneumothorax. The spleen may be easily palpable.

The note elicited by percussion depends much on the degree of intrapleural tension. In absence of increased tension, the note is highly tympanitic over the whole air-containing cavity and also beyond the sternum, on account of the displacement of the heart and mediastinum. The tympany may be present over the compressed lung, being transmitted through it as it is through the lower part of the liver when the abdomen is highly tympanitic. If the intrapleural tension is high, the note becomes shorter and higher in pitch,—almost dull, in fact,—with decided increase in the feeling of resistance on percussion. In demonstrating such a case recently to my students the note over the tense pleural cavity was found to occupy in quality a position about midway between the markedly tympanitic note over the stomach and the flat note over the liver. On

inserting a cannula and allowing some of the air to escape the note became highly tympanitic, and the chest-wall much more elastic. When effusion occurs, the fluid collects at the base of the chest; over its surface the note is flat. The fluid increases freely with changes of position of the patient; so that its surface is always horizontal. The diaphragm may be so much depressed as to contain the fluid in the concavity formed by its upper surface; so that the presence of fluid cannot be demonstrated by percussion in the erect position.

If the perforation in the lung is valvular and the intrapleural pressure therefore high, compressing the bronchial tubes as well as the lung, no breath-sounds may be audible or only a distant, faint, amphoric inspiratory sound is discernible.

When the perforation is free, the air not being imprisoned and the tension low, loud amphoric breathing may be heard. The peculiar quality is due to transmission of bronchial sounds through a large resounding cavity; the sounds should therefore be heard when the bronchi contain air in free communication with the glottis. The voice, cough, and all adventitious sounds also have an amphoric quality. Metallic tinkling or echo is often heard; it may be produced by any movement, as in respiration, cough, speaking, swallowing, or movements of the heart or of the body.

The bell-sound is produced by striking a coin lying flat on a part of the chest over the air-containing cavity with another coin. A ringing metallic sound is conveyed to the ear or stethoscope applied to the chest anywhere over the cavity.

Literature of '96-'97-'98.

Method analogous to the one used by Trousseau employed for pneumothorax.

The patient is examined sitting or standing. The physician applies his ear or the stethoscope to one side of the chest, while an assistant, holding a coin against the opposite side of the chest, taps it lightly and quickly. Where the ear alone is used, the opposite ear is plugged. When the lung is healthy, the sound perceived is dull and flat. If hepatization or tubercles exist, the sounds are less distinct than in the normal lung. When there is air in the pleural cavity, the "brass sound" of Trousseau is observed. But, if there is liquid in the pleura, the sound becomes clear, acute, and silvery, seemingly immediately under the auscultating ear.

But it is not pathognomonic; it may occur without liquid and be absent when the latter is there, because this sound is produced only when the medium is homogeneous. Where there is unquestionably liquid in the pleura, it enables exact determination of the upper limit of it. A. Pitres (*Sem. Méd.*; *Amer. Medico-Surg. Bull.*, Oct. 25, '98).

With air and fluid present, succussion-splash (first described by Hippocrates) may be obtained by shaking the patient or by his making sudden movements as in sitting up or lying down. It may be audible at some distance or only on applying the ear to the chest. It may also convey a shock to the hand placed on the chest.

Diagnosis.—In cases with the characteristic symptoms—tympany; absence of breath-sounds, enfeebled and amphoric; the bell-sound; the displaced heart; sudden onset, with pain, and urgent dyspnoea—the diagnosis is easily made.

In high intrapleural tension the dull note has not infrequently led to a diagnosis of pleural effusion.

PHTHISIS.—When the lung is largely excavated, with only the thickened pleural sac remaining, the signs closely resemble those of pneumothorax: there is tympany, amphoric breath-sounds, metallic tinkling, and occasionally succus-

sion-splash and the bell-sound. The heart is, however, displaced to the affected side, if displaced at all: a position sufficient to exclude pneumothorax except in presence of very positive evidence.

It may be impossible to distinguish a circumscribed pneumothorax resulting from discharge of an emphysema into a bronchus, or by the extension of a cavity in the lung to the surface, from a cavity lying near the surface of the lung, whether due to tuberculous excavation or to a dilated bronchus.

EMPHYSEMA ordinarily is not likely to be confounded with pneumothorax: it is bilateral, while the latter is unilateral. In cases of fibrosis of one lung the compensatory emphysema of the opposite lung may simulate pneumothorax in physical signs, including displacement of the heart. But the occurrence of pneumothorax in a case in which the opposite lung is so much crippled in its function would cause the direst distress if the patient survived the immediate effects of the attack.

INJURIES OF THE CHEST.—Diaphragmatic hernia of the stomach and intestines from a crushing injury may closely simulate pneumothorax. The lung would be crowded upward rather than against the spine, and the breath-sounds over it would be exaggerated and not amphoric or suppressed.

A SUBPHRENIC ABSCESS resulting from ulceration of the stomach or bowel and containing gas may crowd the diaphragm as high as the third or even the second rib, and present the signs of the presence of fluid and air similar to those of pyopneumothorax. There would, however, be a history of abdominal trouble, harsh vesicular breathing in the lung above the abscess, great downward displacement of the liver, and but little displacement of the heart.

After all, the most common error in regard to pneumothorax is in overlooking its presence in those cases in which its symptoms are absent.

Etiology.—With the possible exception of the formation of gas in the pleural cavity from the decomposition of exudation, pneumothorax always results from perforation of the pleura and entrance of air through the opening. Perforation may take place from disease of the organs within the chest or externally through the chest-wall.

PNEUMOTHORAX FROM DISEASE OF THE THORACIC ORGANS.—Of all the causes, the most common is perforation of the pleura by a tuberculous focus in the subjacent lung. Walshe, Fräntzel, and others of the older writers ascribed 90 per cent. or more to this cause, and recent observers have not altered their estimate. Even in pulmonary tuberculosis the disease is rare, not occurring probably in more than from 5 to 7 per cent. It occurs usually in adults, but is met with also in children, and more frequently in males than females. As pointed out by S. West, perforation generally takes place while the patient is at rest, not rarely during sleep, and in absence of cough or violent respiratory effort. It is worthy of note that these are the conditions in which hæmoptysis also occurs. In both the process is ulcerative, and rupture usually has no part in it.

Of the remaining 10 per cent. the majority are due to ulceration of an empyema through lung-tissue into a bronchus. Next to this is gangrene of the lung. Other causes are abscess and hydatid of the lung or mediastinum, bronchial ulceration, and rupture of an emphysematous vesicle. Osler reports a case due to rupture of an hæmorrhagic infarct in chronic heart disease. Sometimes the disease develops in persons

otherwise apparently healthy; many of these are probably tuberculous.

PNEUMOTHORAX FROM WITHOUT may be due to traumatic injury, as in stab wound, fracture of a rib with wounding of the visceral pleura, or in severe injuries of the chest without wound or fracture. It is important to note that pneumothorax follows only in a small number of these conditions; this is due to the presence of adhesions between the visceral and parietal layers of the pleura and because blood often closes up the perforation or rupture made. Other causes of perforation are abscess in the chest-wall opening both externally and into the pleural cavity, rupture of a cancerous stricture of the œsophagus into the pleura, or perforation of the diaphragm by an abscess resulting from ulcer of the stomach or colon and communicating with them.

Literature of '96-'97-'98.

Case of pneumothorax and pneumopericardium caused by the spontaneous evolution of gas as the result of the zymogenetic properties of the bacterium coli. Richard May and Ad. Gebhart (Deut. Archiv f. klin. Med., Oct. 27, '98).

Morbid Anatomy.—If the pleural cavity is distended with air its presence is easily demonstrated by introducing a small cannula, when the air will escape with more or less force, as may be shown by its effect on a lighted match or candle. If the air is not under pressure care is necessary in making the autopsy to demonstrate its presence when pneumothorax is suspected. "A simple way is to carefully dissect off the intercostal muscles and expose the pleura in one or more interspaces. If the parietal layer is not thickened the visceral pleura can be seen through it; if it is, the dissection should be continued and a small opening made. There is then no difficulty in observing

whether the surfaces were previously in contact" (Fowler).

The heart and mediastinum may be found greatly displaced toward the unaffected side, and the lung partially or completely collapsed. The condition of the pleura varies. If there is no inflammation, the surface presents the normal smooth and shining appearance, but inflammatory changes are usually present and the membrane may be much thickened and its surface covered with a thick mass of lymph. The lung is often adherent at various points. The cavity often contains much fluid, usually purulent, rarely sero-fibrinous.

Careful search should be made for the perforation; if not readily found it may usually be discovered by forcing air through one of the bronchi. Only one perforation usually occurs, but there may be more, and most often found on the external or posterior surface between the third and sixth ribs. The left side is said to be most frequently affected, but S. West, in eighty-three cases, found the right affected in forty-one. The size of the opening varies, usually small at first and enlarging if the patient survives. It may be direct or valvular. If direct the air enters and escapes freely during respiration, the lung usually collapsing completely. If valvular the air enters freely, but cannot escape in expiration; thus the cavity becomes fully distended during inspiration. Then by expulsive expiratory efforts, as in straining and coughing, air is forced into it until the tension becomes as great as that of the intrathoracic air during the most violent of these efforts. Thus, the side becomes greatly enlarged, the mediastinum and heart forced to the opposite side, and the diaphragm pressed downward until possibly the whole liver appears below the costal margin.

The lung is usually tuberculous, and it is in the acute forms that perforation usually occurs. Caseous foci near the surface of the lung break down and necrosis of the overlying pleura may occur before inflammatory adhesion to the parietal surface takes place. In chronic cases, the process being gradual, adhesions of the pleural surfaces occur before the destructive changes reach the surface.

The composition of the air in the pleural cavity when it gains entrance through a punctured wound in the chest is the same as that of the external air; when it enters from a perforation in the lung it consists of the same constituents as that in the alveoli; and when it has laid long in the cavity, its exit being cut off, the oxygen is absorbed and carbonic acid and nitrogen increase, and, in fœtid cases, sulphuretted hydrogen is also present.

Prognosis.—The prognosis depends on the cause and the circumstances under which the pneumothorax develops. It is favorable in apparently healthy individuals, the air being absorbed without the development of pleurisy. In traumatic cases the prognosis depends chiefly on the nature of the injury.

In tuberculous cases the prognosis is grave. The complication occurs usually in those in whom both lungs are affected with the acute caseating types of the disease. Much depends on the condition of the opposite lung; if it is only slightly diseased and the general condition good, recovery may take place, with absorption of the air and fair expansion of the lung. With extensive disease of both lungs a rapidly-fatal result is the rule. In thirty-nine cases collected by Sir R. Douglas Powell the average duration was twenty-seven days. In some cases, however, the condition becomes chronic and the patient is able to go

about with a fair measure of comfort. Arrest of the tuberculous process sometimes follows the occurrence of pneumothorax, but it does not necessarily follow.

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One hundred and sixty cases of pneumothorax collected, of which 104 died, giving a mortality of $62\frac{1}{2}$ per cent. The mortality in those cases in which the pneumothorax developed in the hospital was much higher (77 per cent.) than in those admitted some time after the condition has been established (33 per cent.). This is explained by the fact that the proportion of deaths is much greater during the first week than at any subsequent period. Death is due to either rapid suffocation or shock within a very short period after the rupture, or as a result of effusion, or as a result of the disease-process which produced the pneumothorax, usually phthisis. The prognosis depends upon (1) the urgency of the symptoms—that is to say, the amount of dyspnoea and cyanosis; (2) the condition of the opposite lung, the development of râles being a very bad omen; (3) the ability of the right heart to overcome the increased resistance in the pulmonary circulation, any sign of dilatation being unfavorable; (4) the general strength of the patient, particularly the development of the respiratory muscles; (5) the nature of the disease which has led to the pneumothorax. Recovery from the disease is rare, but it may occur and may be apparently complete and permanent. The most favorable cases are those in which there is no pulmonary disease and in which no effusion has taken place. If the effusion does occur, but is purely serous in character, the prognosis is also good. S. West (*Lancet*, May 8, '97).

From study of recurrent idiopathic pneumothorax without effusion, following conclusions are reached:—

1. That simple or idiopathic pneumothorax is a very rare disease of the lungs and pleura.
2. That a repetition of the disease in the same lung is of still greater rarity.
3. That in a very small number of

cases the entrance of air into the pleura—to stretch it to its utmost limits—does occur without any effusion of fluid; and this even may happen a second time in the same lung.

4. That the absence of fluid renders the disease less fatal than when air and fluid are effused.

5. That the presence of air in the pleura may occur without any febrile or constitutional disturbance.

6. That in the face of such possibilities we should be cautious as to giving too grave a prognosis when evidences of a ruptured lung and pleura are present, and particularly so when there is no previous disease.

7. That the tendency of such cases is toward spontaneous recovery, and, in the absence of urgent symptoms calling for relief, it is wiser not to employ surgical means to let off the effused air. J. M. Finny (Dublin Jour. of Med. Sci., Apr. 1, '98).

Treatment.—In most cases this can only be palliative. If the onset is sudden, with severe symptoms, morphine should be given subcutaneously for the relief of the pain and dyspnoea, and to soothe the mental distress. Stimulants are usually needed to counteract the prostration. If the cyanosis and dyspnoea be great, dry cupping may give some relief. For the pain caused by the pleurisy that usually follows three or four leeches may be applied, followed by hot fomentations, after which the chest may be strapped.

Literature of '96-'97-'98-'99.

While the serious phenomena met with in acute traumatic pneumothorax vary in intensity according to individuals and circumstances, and in some cases are so slight that they may be disregarded, it is the duty of every surgeon whenever he is about to undertake an operation on the chest or neighboring region which might involve the pleura, to assume that sudden admission of air into the pleural cavity is inevitable and he must be prepared to meet the evil effects of acute atelectasis.

The procedure that promises the most benefit in preventing pulmonary collapse in operations on the chest is artificial inflation of the lung and rhythmical maintenance of artificial respiration by means of a tube in the glottis directly connected with a bellows. The best means hitherto used for inflating the lung in cases of acute traumatic pneumothorax is afforded by a bellows devised by Fell by which air is passed through an O'Dwyer intubation-tube inserted, as in cases of diphtheria, into the glottis. Matas (Annals of Surg., Apr., '99).

In most cases the question of paracentesis has to be considered. If the pressure within the chest becomes great and the dyspnoea urgent in consequence, a small cannula should be passed to allow air to escape. The operation must be done with the most careful antiseptic precautions. The lowering of the intrapleural pressure may be followed by the reopening of the perforation if it had become sealed with lymph; but if the distress is urgent even this risk must be taken. Following the removal of the cannula there is a liability to subcutaneous emphysema; this may be avoided by making pressure on the puncture for a short time after withdrawal of the cannula.

In tuberculous cases with purulent pleural exudate the course may be chronic without marked disturbance. Such cases had better be left alone. Aspiration is only followed by temporary relief, and free incision with drainage results in improvement for a time, but as the lung usually does not expand decomposition of the exudate takes place and sepsis is produced. In many, greater activity of the tuberculous process is also excited. If the amount of fluid becomes great, we must interfere. Aspiration should first be tried, and repeated from time to time as necessary, usually more active measures must be adopted. God-

lee recommends passing two aspirator-needles into the chest, one in front and the other below the angle of the scapula. To the anterior needle tubing is attached, which passes into a bottle of sterilized boric-acid solution,—temperature, 100° F.; to the other needle the aspirator is attached; as the fluid is drained off from the back of the cavity, the patient lying on his back at the edge of the bed, the boric-acid solution enters through the anterior needle. The aspiration is continued until the solution comes away quite clear, when the anterior needle is removed and the chest emptied by the aspirator as far as possible.

If the liquid is foetid, incision and free drainage offers the best, if not the only, hope of relief. A young man whom I saw several years ago seriously ill with this condition was able, shortly after free drainage was effected, to walk a few miles daily and attend to a little business for some months, dying ultimately of the tuberculosis, but relieved of the sepsis. Such tuberculous cases, however, rarely recover, succumbing usually to the tuberculous infection; but it seems better that they should die without, than with, the pleural cavity full of pus. As in empyema, ribs may have to be resected, and pulmonary gymnastics should be persistently practiced to secure re-expansion of the lung.

Literature of '96-'97-'98.

The position of the patient with the sound side upward is of great importance during anæsthesia in pyopneumothorax. Two cases have been recently recorded in each of which death followed the turning of the sound side of the patient upward to facilitate operative procedures, death being due to a flow of pus into the bronchial tubes of the sound lung. Bowles (Med. News, Jan. 8, '98).

Hydrothorax.

Definition.—The occurrence of a se-

rous transudation into the pleural cavity apart from inflammation is termed *hydrothorax*, or *dropsy of the pleura*.

Symptoms.—The symptoms are those resulting from interference with respiration. They are usually attributed to the primary disease, and the hydrothorax is overlooked, often from want of examination on account of the weakness of the patient. In all cases of increasing dyspnoea, cyanosis, and prostration the chest should be examined for pleural dropsy, as removal of the fluid may relieve the symptoms and afford the patient a chance of recovery.

The *physical signs* are those of pleurisy with effusion, but somewhat modified, on account of the absence of fibrinous layers on the pleural surfaces. There is less distension of the side. Vocal fremitus is absent. The breathing may be bronchial on account of collapse of the air-vesicles; it is usually faint. On light percussion the note is dull. There is no friction rub. Frequently there is a crepitant râle over the upper part of the effusion and above it, owing partly to expansion of collapsed vesicles and partly to œdema of the lung-tissue.

Etiology.—Hydrothorax occurs in a variety of conditions from obstruction to the venous and lymph outflow. The great majority of cases occur as a part of general dropsy, especially in cardiac failure, emphysema, and renal disease. In both the latter cardiac failure with anæmia plays the chief part in the causation of pleural dropsy. Mediastinal tumor, by pressing on veins, may also give rise to it.

The amount of exudation into the various cavities varies greatly and for this no satisfactory explanation can be offered. In heart disease the dropsy is often limited to one pleural cavity; in renal disease both are usually affected.

An intrathoracic tumor may cause dropsy on one or both sides, from pressure on the azygos veins.

Morbid Anatomy.—The effusion is a clear straw-colored fluid, rich in albumin usually,—richer than the dropsical fluids of the pericardium, peritoneum, or subcutaneous tissues. This has been attributed to the suction-action of the pleural cavity excited by the retractile energy of the lung.

In recent exudation the pleura is normal in appearance, but after a time it loses its glistening appearance on account of the formation on its surface of a fibrous film which can be peeled off. This is probably due to slight inflammation from prolonged contact of the fluid. The lymphatics of the pleura may form a visibly-dilated net-work. The lung is more or less collapsed, and in cases of long standing requires considerable pressure to expand it.

Treatment.—The treatment should be directed chiefly to the cause. If we can restore the equilibrium in the circulation in the cardiac cases the dropsy will soon disappear. When the presence of fluid can be demonstrated, it should usually be aspirated, as its removal relieves the heart; or at least sufficiently to enable it to recover compensation, especially if, at the same time, the right ventricle be relieved by venesection. Digitalis and similar remedies then become effective, although previously their administration was without benefit.

Hæmothorax.

Symptoms.—The symptoms are those of hæmorrhage, and if the escape is rapid and large there will be dyspnoea in proportion to the pressure on the lung.

The symptoms are those of pleural effusion without fever or friction. The

percussion-note is absolutely flat if coagulation in even a thin layer takes place.

The diagnosis is based on the signs of loss of blood, with those of rapid accumulation of fluid in the pleural cavity.

Etiology.—Hæmorrhage into the pleural cavity may occur from a variety of causes. In traumatic cases there may be rupture of an intercostal or mammary artery, or laceration of the lung. Rupture of an aneurism of the aorta occurs not infrequently into the pleural cavity. Occasionally rupture of an aneurism of the internal mammary occurs, and in rare cases there is an intrathoracic rupture of a vein into the pleural cavity. Rarely bleeding takes place from rupture of a pulmonary infarct, and of a phthisical cavity into the pleura at the same time that a vessel is lacerated. Bleeding may also occur in scurvy and in purpura.

Prognosis.—The outcome depends on the cause of the bleeding, its amount, and the possibility of reaching the bleeding point by surgical means. In traumatic cases there is early coagulation; the serum is rapidly absorbed; but the clot is long in disappearing. If infection occurs, suppurative pleurisy, of course, will follow.

Treatment.—This is purely expectant unless the bleeding-point can be located and secured. Great caution should be exercised in operating when the source of the bleeding is not known. If there is urgent dyspnoea some of the blood should be removed by aspirating.

Any patient who has suffered from simple pleural hæmatoma not demonstrated as tubercular should be submitted to severe hygienic measures and close surveillance of the respiratory apparatus. Mesnil (Thèse de Paris, '94).

Chylothorax.

This condition is often designated by the name "chylous pleurisy," but incor-

rectly, as there is no inflammatory process present. A similar collection may exist in the peritoneum.

Symptoms.—The symptoms are such as are caused by non-inflammatory effusion. Pain may be caused by distension of the pleural cavity. Aspiration of the fluid determines the diagnosis, but there may be difficulty in withdrawing the fluid.

Etiology.—It is usually caused by obstruction of the thoracic duct or the receptaculum chyli, but may be due to rupture of either of them. In many cases the seat of lesion cannot be found at the autopsy. The obstruction may be caused by a cancerous growth or a tuberculous deposit.

In case of chylous pleurisy at the necropsy the abdomen was found to contain about 5 ounces of milky fluid and the right pleura 2 pints. In the left pleura there was a pint of turbid serum, with some fat held in suspension. The thoracic duct was dilated in its whole extent, and was blocked at its outlet by thrombosis of the internal jugular and subclavian veins limited to that spot. The liver appeared normal. The general glandular enlargement was due to infiltrations with carcinomatous deposit secondary to scirrhus of the pylorus. Turney (*Lancet*, May 20, '93).

Prognosis.—The outlook is very unfavorable, but the course depends much on the nature of the primary lesion. Probably none recover, death usually occurring in six to ten months.

Treatment.—The fluid should be removed by the aspirator as often as its accumulation causes pain. Nothing more seems feasible.

New Growths of the Pleura.

Most of the new growths occurring in the pleura are secondary to deposits elsewhere. The majority arise by direct invasion from a primary lesion in the lung, but they may follow disease elsewhere, especially of the mammary gland.

Of the primary growths, carcinoma is the most common, but sarcoma and fibroma also occur.

Symptoms.—The clinical history presents great variety. Pain may be absent, slight, or severe. Loss of strength and flesh occurs, but emaciation is rare. Usually there is dyspnoea and cough. In diffuse cancer of the pleura secondary to primary cancer of the lung the pleural symptoms may so predominate that the lung disease is lost sight of. There is marked dullness and weak fremitus and breath-sounds. In the majority of cases the signs point to marked pleural effusion with displacement of the heart and enlargement of the side. In some cases, however, marked retraction takes place.

The course is usually rapid, death occurring in a few months.

Diagnosis.—New growths of the pleura can rarely be distinguished from other forms of pleurisy—chronic tubercular, especially—until well advanced. The effusion is usually blood-stained, and the characteristic elements may be found with the microscope.

Literature of '96-'97-'98.

Case of pleural effusion in which the exudate was examined, a diagnosis of spindle-celled sarcoma of the pleura made, and diagnosis was confirmed post-mortem.

The exudate contained groups of typical spindle cells, as differentiated from the flat cells of the endothelium commonly found in pleural exudate and also differing from the irregular spindle cells found in plastic pleurisy. R. S. Warthin (*Med. News*, Oct. 16, '97).

Morbid Anatomy.—The primary carcinoma is usually of the endothelial type. In most cases there is much thickening of the pleura, more of an inflammatory character than of new growth. The origin of the growth is uncertain, but

probably from proliferation of the epithelium of the primitive body-cavity.

The pleural cavity usually contains much bloody fluid. There may be metastasis to other organs, and the growth may appear in front of the ribs and infiltrate the superficial structures. This was the case in a man whom I saw last year. His left chest was contracted and a large area of its anterior surface much indurated by cancerous deposit.

Treatment.—As the condition is absolutely unamenable to treatment, nothing can be done but relieve the distressing symptoms as far as possible. Paracentesis is usually followed by rapid reaccumulation of the fluid.

Echinococcus of the Pleura.

This affection is very rare, being met with primarily in the pleura in probably less than 1 per cent. of all cases; as a secondary infection, especially from the liver and lung, it is somewhat more frequent.

The cyst is usually single, growing inward from any part of the pleura. It compresses the lung and gives rise to the signs of a circumscribed pleural effusion of which the outline may be irregular. In a few cases it grows outward and causes bulging of the chest-wall and may perforate it, causing a chronic fistulous opening.

The cyst-wall is formed externally of the much-thickened and dense pleura and internally by the laminated membrana propria of hydatid cysts. The fluid contents are clear, though rarely they may become purulent from secondary infection.

As in hydatids of the liver, so here, the health may continue good. Pain, however, may be an early and persistent symptom. Pressure symptoms are added as the cyst enlarges, and the lung becomes compressed and the heart dis-

placed. The temperature is normal unless inflammatory symptoms develop. Anæmia and loss of flesh may become marked. Occasionally there is hæmorrhage into the pleural cavity.

Diagnosis.—The diagnosis is usually difficult. The true nature of the condition may be suspected from the evidence of a growing cyst without fever. There may be pain and loss of flesh. Tactile fremitus is absent. Circumscribed pleurisy and new growth will cause similar symptoms, but may be differentiated by puncture and careful examination of the fluid for hooklets.

Treatment.—If left to run its course it usually terminates fatally. In the treatment simple aspiration is rarely sufficient, while free incision with liberal resection of ribs, if done early, rarely fails to effect a complete cure.

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PLEURISY.—Inflammation of the pleura may occur as a *primary* affection, or, perhaps more frequently, it is *secondary* to a general or local disease.

Acute Pleurisy.

Symptoms.—In many cases of acute pleurisy the onset is insidious; it is usually so when it occurs secondarily to some grave disease whose symptoms mask those of the pleurisy. It is usually latent also when it occurs late in such exhausting diseases as carcinoma, nephritis, and tuberculosis.

Ordinarily, however, an attack of pleurisy sets in with slight shivering followed by fever and pain in the side. In some cases there is an abrupt chill, especially in pneumococcal pleurisy, which may closely simulate pneumonia. In children the chill is usually replaced by vomiting, sometimes by a convulsion.

Pain is the most distressing and constant symptom; it usually occurs in the neighborhood of the nipple or in the axillary region. It may, however, be referred to the back or to any part of the abdomen. So severe and circumscribed has it been in the abdomen that a diagnosis of appendicitis has been made and an operation performed. The pain ordinarily is sharp and excruciating, aggravated by respiratory movements and cough. It is usually relieved when the effusion becomes sufficient to separate the pleural surfaces, but in severe cases it may persist and be felt in the distribution of the intercostal nerves in the abdomen. There is tenderness along their course and there seems no doubt that the pain is due to extension of the inflammation to the perineural sheaths, possibly to the intercostal muscles in some cases.

Cough is an early symptom, being worse usually in the early stage. It is short, dry, and, as it increases the pain, is repressed as much as possible. There may be slight mucoid expectoration on account of associated bronchitis. The temperature for the first week or ten days usually rises to 101° or 102° F.; in the pneumonic type it may be as high as in pneumonia, with an incomplete crisis followed by a second rise. It generally, however, declines by lysis in about ten days, but the fever may persist for weeks, taking on a hectic character even in sero-fibrinous cases, suggestive of suppurative exudation. Such cases are probably tuberculous.

The pulse is moderately quickened. The pulse-respiration ratio does not undergo the marked change so characteristic of pneumonia. The respiration is increased in frequency at the outset on account of the pain and later on account of the bulk of the exudate. The effect of the effusion on the respiration depends

much on the rapidity of its accumulation,—a rapid exudation causing much dyspnoea, while one slowly formed may produce no conscious disturbance so long as the patient is quiet, although the pleural cavity may be moderately distended. In the early stage the decubitus varies, but when the effusion becomes copious the patient usually lies on the affected side.

PHYSICAL SIGNS.—These depend chiefly on the nature and amount of the exudation. (a) In pleurisy with recent fibrinous exudation on inspection the movements of the affected side are seen to be restrained on account of the pain; the expansion may be jerky. The patient often lies with the body bent toward the affected side. On palpation vocal fremitus is usually unaffected unless the exudation is abundant, when it is lost. Occasionally friction-fremitus can be felt.

Percussion may yield negative results, or there may be somewhat diminished resonance, owing to lessened expansion of the lung and the considerable amount of plastic exudation.

For the same reasons, on auscultation the breath-sounds are weak or even absent. Friction-rub may be heard and is the diagnostic sign. When well defined it is heard as a to-and-fro sound in inspiration and expiration. It may be heard in deep inspiration only. Usually in children and not rarely in adults it is absent. It may be heard only in small areas,—in the inframammary or axillary region,—and is therefore liable to be overlooked. It is formed by a succession of superficial creaking or rubbing sounds, but may resemble a crackling r  le. It lasts but a few hours in cases of rapid effusion. In pleurisy in the neighborhood of the heart a friction-sound of cardiac rhythm may simulate pericardial friction.

(b) In pleurisy with effusion inspection also furnishes valuable assistance. If with the occurrence of effusion separating the pleural surfaces the pain is relieved, the chest-movements become more free. However, as the fluid increases the expansion lessens and disappears if the effusion becomes large, while that of the unaffected side increases. The intercostal depressions become widened and obliterated, giving the chest a smooth, rounded appearance with increase of the antero-posterior diameter. In large effusions the mediastinum is displaced toward the sound side, most markedly so in effusions into the left pleura. The position of the cardiac impulse is the best index to the degree of mediastinal displacement, and therefore of the amount of pleural effusion. It may appear at the left axillary line or as far to the right as the right mammary line. The downward displacement of the diaphragm is measured by the position of the liver and spleen, the lower borders of which may be at or below the umbilical line.

The diaphragmatic phenomenon—consisting of visible horizontal depression crossing the lower part of the sides of the chest and moving up and down with the respirations and representing the movement of the diaphragm as the lower edges of the lungs become inflated or collapsed—achieves its greatest triumph in unilateral thoracic conditions. If absent on the one side and normal on the other, there is a considerable effusion of liquid or air into the affected pleural cavity, or else pneumonia of the lower lobe. In cases of serous effusion slight diaphragmatic motions are often visible abnormally far downward. Litten (*Med. Rec.*, Dec. 28, '95).

The important sign of liquid effusion on percussion is the flat note and the increased, or "board-like," resistance over the whole surface of effusion. This loss

of resonance and elasticity is due chiefly to the liquid in the pleural cavity, but partly also to the collapsed state of the lung beneath the fluid. The dullness extends from the base upward, usually highest in the axilla and sloping somewhat lower to the front and back. When the effusion rises higher than the angle of the scapula the lung will have relaxed to such a degree as to give a tympanitic note above the nipple: the Skodaic resonance. Posteriorly the note is usually somewhat impaired far up the back. The level of the fluid is usually altered by a change of position of the patient. On this point, however, different observers report different results. Possibly in moderate effusions the fluid changes gradually with change of position of the patient if there are no adhesions. In some cases, in which the effusion has formed in the recumbent position, the area of flatness corresponds with the surface of the lower lobe of the lung; but in some of these the exudate is almost wholly fibrinous. The lower limit of flatness on the right side passes into and cannot be distinguished from liver-dullness; on the left extends to and, in large effusions, it obliterates sternal resonance: Traube's semilunar space.

The best manner of demonstrating the movement of the exudate is to examine the patient first sitting and then prone. The sero-fibrinous exudation changes its position with that of the body when it is small in quantity or when medium in amount, and no strong pressure on the parenchyma of the lungs is occasioned. The thin serous change their position faster than the sero-fibrinous fluids. Baccelli (*Revista clin. e ter.*, Sept., '90).

Literature of '96-'97-'98.

Cases of collection of fluid in the pleura sometimes occur where the presence of lymph adherent to the visceral or parietal pleura, or thickening of the

pleura itself, gives signs which so closely resemble them that the differential diagnosis becomes a matter of some difficulty. In such cases the presence or absence of the following physical sign has been found useful: The patient should be standing, or in the sitting position, with the head and neck inclined forward so as to render the skin and muscles of the back somewhat tense. The observer stands on the left side of the patient and, placing the left hand flat and fairly firmly on the lower part of the thoracic wall just below the nipple, percusses sharply either with a finger of the right hand or with a pleximeter on the ribs of the same side, striking them just posterior to the angles, when, if no fluid be present, a very slight vibration of the rib which is struck posteriorly is felt by the left hand in front; but if there be fluid in the pleura the vibration of the rib is much greater, and if the quantity of fluid be at all considerable the difference between the sensations experienced by the left hand when examining the sound and affected sides is most marked. T. H. Kellock (*Lancet*, Mar. 28, '96).

Vocal thrill is at first weakened and later, with increase of exudation, lost over the area of dullness. In rare cases it remains unaffected, especially in children. This may be due to conduction of vibration from the spine along the ribs.

As regards auscultation, for the first few hours or more, before the effusion is sufficient to separate the pleural surfaces, a friction-rub may usually be heard over the affected area. The rub is a to-and-fro sound heard in inspiration and expiration, but may be heard only on deep inspiration. It is superficial, being quite close to the ear, and has a creaking quality; more often, owing to the exudate's containing much serum from the first, the friction is soft and crepitant, resembling the crepitation of pneumonia. Friction often returns as the fluid is absorbed and the surfaces come into contact again.

The respiratory sounds are weak or absent below the level of the exudate, but often in children and occasionally in adults tubular breathing is audible all over the dull area, especially if the pleural cavity is so full as to collapse the lung, but not to compress the bronchi. Only a puffing expiration of amphoric quality may be present, or the breath-sounds may be intensely amphoric or cavernous and may lead to a diagnosis of cavity, or pneumothorax.

Vocal resonance is usually weak or absent over the effusion. Like the breath-sounds, it may also be bronchial. In moderate effusions there may be ægophony, heard most commonly about the angle of the scapula. It is not a sign of importance, because it is often absent in this and present in other affections. The whispered voice, it is said, may be clearly transmitted through serous, but not through purulent, exudations (*Bacelli's* sign). It is, however, in some cases transmitted through purulent exudations.

The coin sign is obtained by laying a coin on the front of the chest and striking it with another; the ear placed at the back of the chest has transmitted to it in some cases a clear metallic sound, if a pleural effusion is present.

PUNCTURE.—Exploring the chest with the aspirator affords the most positive means of determining the existence of fluid and its character. If the needle is absolutely aseptic and the part of the chest to be punctured carefully disinfected, aspiration may be resorted to with impunity in all cases. Certain errors have to be guarded against in exploring the chest with the aspirator. The exudate may be capsulated and the needle pass to one side of the cavity. The pus may be too thick to enter a needle unless of large calibre; for this reason

a large needle should, as a rule, be used, especially as it causes but little more distress than a small one. Even a large needle may be plugged by the false membrane in piercing it, so that no pus can pass. In such a case the suction should be cut off and the needle withdrawn, when the plug of purulent fibrin will be found in the needle and confirm the diagnosis. The needle may enter a purulent cavity in the lung resulting from tuberculosis, pneumonia, actinomycesis, etc. It may draw off pus from a subphrenic abscess, from a purulent pericardial exudate, or from a bronchial tube.

Literature of '96-'97-'98.

Fifty cases of pleurisy with effusion found in 10,416 cases treated in the children's polyclinic in Berlin. In 4 cases the exudate was hæmorrhagic. In the four hæmorrhagic cases, tuberculosis, syphilis, sarcoma, cancer, hæmorrhagic diathesis, heart disease, acute infectious diseases, and nephritis were excluded. The cases were between the ages of twelve months and five years: 1 girl and 3 boys. In 1 the outcome is unknown, the other 3 recovered. The diagnosis cannot be made with certainty between this form and other pleural effusions except by the use of the exploring needle. Lewin (*Jahrbuch für Kinderh.*, No. 16, '98).

PULSATING PLEURISY is a rare phenomenon. Sixty-eight cases have been collected, mostly on the left side, and only one was sero-fibrinous, the rest being purulent. The impulse may be heaving and limited to the sternal region, or diffused and most marked in the axillary and scapular regions. In some of the cases pulsation did not occur until perforation of an intercostal space led to the formation of an abscess-sac beneath the skin,—*empyema necessitatis*,—the pulsation being confined to the subcutaneous abscess.

Course and Termination.—The affection presents a very variable course. In dry pleurisy the inflammation may rapidly subside and recovery take place in a few days. In some there is persistence of pain for some time and fresh attacks in other parts of the pleura. In these the pleurisy is secondary to other affections, chiefly pulmonary tuberculosis.

In cases of sero-fibrinous effusions the fluid may increase for a week or ten days, when, the active process ceasing, absorption sets in and rapid recovery follows. Or absorption may not begin until after the lapse of a stationary period of indefinite duration. Recovery is rarely complete in less than a month; in cases of considerable effusion it requires a much longer time, especially if aspiration is required. Absorption rarely begins during the continuance of the fever.

A sero-fibrinous effusion may persist for months, especially in tuberculous cases, notwithstanding repeated aspirations. Sero-fibrinous pleurisy is rarely fatal, yet excessive effusion is not without risk. Even though the effusion causes little discomfort while the patient is at rest, sudden death is liable to occur, especially on exertion. Death may be due to thrombosis or embolism of the pulmonary artery, to clot in the right ventricle, to degeneration of the heart, or to œdema of the uncompressed lung. Displacement of the large thoracic vessels with compression, especially of the inferior vena cava, has been regarded as a cause, but at most is only an improbable one. Dullness often persists after the effusion is absorbed. It may be due to unexpanded lung or to copious fibrinous exudation. It may persist throughout life.

Retraction of the chest sometimes follows absorption; it may be local or general.

In purulent cases the duration is much

prolonged. The exudation is occasionally absorbed when due to the pneumococcus; but this is rare and never occurs in streptococcal cases. Left to itself, the exudation may discharge by external rupture, by rupture through the lung, or into some other cavity or organ. With early and effective drainage recovery may be complete without any retraction of the chest or impairment of expansion. Such results have been obtained even after the exudation has existed for six months or more. The degree of interference with expansion of the lung, and consequently of retraction of the chest, is determined by the amount of thickening of the visceral pleura resulting from organization of adherent lymph or from changes in the pleura itself and subjacent lung-tissue. The defect may be compensated for by enlargement of the upper part of the affected lung as well as of the opposite lung; so that dyspnoea does not result. Bronchiectasis sometimes develops in the contracted lung, and may affect the opposite lung also.

In neglected cases the pus will usually in time perforate the chest-wall: *empyema necessitatis*. The opening most commonly occurs in front in the fifth interspace, where the chest-wall is thinnest, but it may take place anywhere from the root of the neck to the buttock. The course in such cases is very tedious,—often the opening never closes. In a young girl under my own observation it lasted eleven years. There was extreme retraction of the chest. Rupture may also take place into the œsophagus or the pericardium. The diaphragm may be perforated and the pus discharged into the stomach, intestine, gall-bladder, or even the pelvis of the kidney. Or it may pass down the spine and appear as a psoas or lumbar abscess.

Perforation of the lung may occur and

lead to the rapid discharge of pus through the bronchi. The discharge may be so rapid as to suffocate the patient, but the discharge may be gradual and recovery ultimately follow. Air usually gains access to the sac: pyopneumothorax.

In some cases, especially those of tuberculous character, the pus may cause more or less extensive superficial necrosis of the lung and be gradually filtered through spongy lung into the bronchi. In these pneumothorax does not follow. In some cases the opening into the bronchi is valvular, and the pus is then discharged intermittently.

Perforation of the lung rarely takes place before the empyema has existed six weeks or more. It may occur after free drainage has been established by operation, or spontaneous discharge through an intercostal space has occurred. Or the perforation of the lung and discharge through the bronchi may precede the intercostal perforation. This occurred a year or two ago in a man who had a circumscribed empyema from perforation of the diaphragm by an appendiceal abscess.

Nowadays all such terminations, fortunately, are rare, as necessary operations for the discharge of the pus are usually done early.

Diagnosis.—Though the diagnosis of pleurisy is usually easy, perhaps no disease within the thorax is more frequently unsuspected. The difficulties belong chiefly to the earliest and the latest stages. In the earliest the symptoms may be latent and thus render the diagnosis impossible. In acute dry pleurisy, if the friction-rub is present, the disease is easily recognized. If the rub is absent, it may be difficult to distinguish it from pleurodynia and intercostal neuralgia. In these latter affections there is no pyrexia and the tenderness is more marked along the course of the nerves

than in pleurisy. In doubtful cases careful repeated examination should be made over the area of pain, lest effusion occur and be overlooked and do much damage.

In the later stages when the effusion is abundant, the diagnosis may be very difficult. In this condition the diagnosis is based upon the enlargement and immobility of the chest, dullness with loss of elasticity over the dull area, absence of vocal thrill, weakness or absence of respiratory sounds, and the displacement of the cardiac impulse toward the unaffected side. Of these signs the cardiac displacement is the most important: it, in fact, furnishes the key to the condition.

If there be high-pitched tympanitic resonance below the clavicle, it is very characteristic of fluid below. In moderate effusions these signs may be wanting or indefinite, and the case may closely simulate pneumonia. This history of initial chill, the rapid rise of temperature, the dyspnoea, the rusty sputum, and the dullness without the wooden character usually serve to differentiate pneumonia. But pleurisy, especially that due to the pneumococcus, may simulate this history closely: there may be the initial chill, rapid rise of temperature, dyspnoea, tubular breathing, with high-pitched expiration, all these without displacement of the heart.

In the diagnosis of consolidation of the lung from serous or purulent effusions, age of the patient considered as important. Serous effusion is seldom found under four years of age, empyema being most common at that period of life. Some of the fine auscultatory signs—for instance, the greater transmission of sound in cellular fluids—seem without value, especially in children. Forchheimer (*Archives of Ped.*, Nov., '91).

Literature of '96-'97-'98-'99.

Crepitation in the lower portions of the lung on the affected side is of great

importance in diagnosis of slight pleural effusion. In cases of large effusion it is of little significance. One will hear, on careful auscultation over the lower portion of the lung, a fine crepitation that is present with inspiration only, and consists of small, somewhat moist râles that differ from the râle of beginning pneumonia in being moist, and from *crepitation redux* in that all of the râles seem of the same size and are extremely fine; in resolving pneumonia they are larger and more liquid. W. Janowski (*Zeit. f. klin. Med.*, B. 36, H. 1, '99).

In case of doubt as to the presence of effusion, exploring the chest with the aspirator usually determines the character of the case. With extreme care as to aseptic precautions there is no risk in exploring the base of the chest; in the rare cases of localized exudation at the apex there is some danger of wounding the large vessels. Not infrequently, however, puncture fails on account of the situation of the fluid—as in diaphragmatic pleurisy, its circumscribed character, or its density.

A large pericardial effusion is sometimes difficult to distinguish from left-sided pleural effusion. The position of the cardiac impulse is the most important guide; it is not displaced to the right in pericardial effusion. The heart is feeble and the impulse weak and may be diffuse.

In pleurisy the impulse is commonly easily felt unless it is behind the sternum and the heart-sounds are strong. In large pericardial effusion there is marked dyspnoea and a peculiar cyanotic hue of the general surface. In the left axilla the percussion-note is Skodaic unless obscured by associated pleural effusion. In the latter case removal of the pleural effusion is not followed by due relief and the cardiac impulse is not affected.

On the right side subphrenic abscess

or hydatid cyst of the liver may force the diaphragm high in the thorax and be mistaken for pleural effusion. The upper limit of dullness is usually arched and in some cases a friction-rub is present over all parts of the tumor: a sign that should arouse suspicion. Then there is fullness and a feeling of tension in the hypochondrium; the liver is sometimes depressed, but it may be in pleural exudations also. On introducing a cannula the pus is forced out during inspiration in subphrenic abscess, in pleural effusion during expiration.

Hydrothorax presents all the signs of pleural effusion, and intrathoracic tumors may simulate and often give rise to it.

As to the nature of the effusion, if the signs leave us in doubt the use of the aspirator usually decides with certainty. Hectic fever, sweats, œdema of the chest, bulging of the intercostal spaces, prominence of the veins of the chest, and leucocytosis indicate the presence of pus. Sero-fibrinous effusion, however, may be attended by protracted fever, with general prostration. On the other hand, purulent effusion may exist without definite symptoms.

Literature of '96-'97-'98.

Aid to differential diagnosis of fluids in pleura. If the patient is made to utter the word *trentatre* (= Italian thirty-three) in a whisper, every letter of the word will be heard in case the fluid is very thin, but in proportion as this becomes heterogeneous, and especially if purulent, the letters are gradually lost up to final disappearance of all conduction. The first letter to go is *r*, then *t*, then *n*, and finally the vowel-sounds. One should use direct auscultation in the antero-lateral and inferior regions of the thorax, without any stethoscope. Baccelli (Il Policlinico, June 15, '96).

Displacement of pleuritic fluid when patient changed his position observed

with the fluoroscope. Purulent effusions were less opaque than serous. Bergonié and Carrière (Sem. Méd., Dec. 15, '97).

Etiology.—Pleurisy occurs at all ages, even in the infant of a week or two, as well as in the aged. Sero-fibrinous pleurisy is probably most common between the ages of twenty and forty, while empyema is more frequently met with in children under ten years of age. Males, especially in the middle period of life, suffer much oftener than females.

Chill from exposure to cold and wet is often the exciting cause of pleurisy. It probably acts here, as well as in other diseases, by lowering vitality through disturbance of nutrition, thus rendering the pleura more susceptible to the agent exciting the inflammation.

A weakly constitution and previous ill health have a marked effect in lowering the powers of resistance to the influences that produces disease. This is especially evident in the liability to pleurisy among those who have a tendency to pulmonary tuberculosis.

Pleurisy often results from extension of inflammation from neighboring diseased organs, especially from the lungs; also from the pericardium and mediastinum. It may follow also injury of the chest-wall and lungs. It may also occur in the course of acute or chronic diseases, such as septicæmia, the acute fevers, acute rheumatism, Bright's disease, hepatic cirrhosis, and malignant disease.

All the cases of primary pleuritis which occurred in the clinic at Zurich in ten years amounted to one hundred and sixty-three cases. It often commenced like an infectious disease. Engster (Deut. Archiv f. klin. Med., B. 45, A. 3-6, '90).

During the secondary stage of syphilis a specific form of pleurisy may develop,

being frequently bilateral, arising and disappearing rapidly, the recovery being perfect and influenced by specific treatment. The affection generally makes its appearance two or three months after the appearance of the chancre, and rarely as late as from eighteen to twenty-four months afterward.

The onset may be insidious and unmarked by any symptoms; or acute, and accompanied by pain, cough, and dyspnea; the former being probably the more frequent. When the latter is the case, the pleurisy may possibly be diaphragmatic. Fever is, as a rule, moderate, and the rise of temperature so frequently seen at this stage of syphilis is probably often due to a pleurisy which is undetected because of the absence of suggestive symptoms.

Of the 14 cases studied, 3 were examples of dry pleurisy and 11 of serous effusion; half were unilateral and half bilateral. Duration is generally about two or three weeks if specific treatment is adopted, and prognosis is good, perfect recovery being the rule. Chantemesse (*La Presse Méd.*, June 30, '94).

Acute rheumatic polyarthrititis is very frequently associated with inflammations of the pericardium, endocardium, and pleura.

The infectious element of rheumatism after entering the circulation causes, primarily, certain general disturbances of the organism, then locates itself upon and in the serous membranes. Fiedler (*Schmidt's Jahrbücher*, No. 1, '92).

Literature of '96-'97-'98.

Pleuritic effusions in connection with ovarian tumors are to be regarded not as an independent complication, but as a direct result of the presence of the neoplasm. The effusion develops gradually and is unaccompanied by pain or fever. The accumulation of fluid is not due to the presence of the tumor or to changes in the blood, but is really an evidence of metastasis to the pleura, less frequently of peritoneal irritation transmitted through the diaphragm. It is, accordingly, strong evidence of the malignant character of the tumor, provided

that torsion, suppuration of the cyst, etc., can be excluded.

A pleuritic effusion, instead of furnishing a contra-indication to operative interference, may show the necessity of an early operation, provided that the peritoneum is not too extensively involved. Resinelli (*Annali di Ostet. e Ginecologia*, No. 18, '97).

Two cases of pleuritis occurring in the course of typhoid fever, in which the typhoid bacillus was secured in pure culture from the aspirated fluid. The fluid was serous in one case, and sero-sanguinolent, becoming purulent later, in the other. Achard (*La Sem. Méd.*, Oct. 19, '98).

But in the majority of cases pleurisy occurs quite independently of any of the foregoing conditions. Examination of the effusion has shown that in many cases the disease is due to irritation of the pleural membrane by microbes, of which those most frequently met with are the tubercle bacillus, pneumococcus, and streptococcus.

Forty-four cases of pleurisy—37 serous, 7 purulent—investigated. In most sero-fibrinous effusions there were no micro-organisms. The presence of staphylococcus pyogenes in a serous effusion does not mean that it will necessarily become purulent. Absence of organisms in empyemata points most probably to a tubercular origin. Presence of diplococcus in metapneumonic serous effusions does not prove that they will become purulent. Exclusive presence of Fraenkel's pneumococcus usually justifies a good prognosis, notwithstanding the radical operation is the best. Levy (*Archiv f. exper. Path.*, etc., July, '90).

Of cultures made with fluid withdrawn from 38 cases of sero-purulent pleurisy, 28 remained sterile, while 4 showed pure colonies of staphylococcus albus; 15 of the 28 were cases of pleurisy in which the affected region was the focus of a tuberculous infection; 1 was a case of pleurisy developing in a case of pulmonary tuberculosis; 7 had suspicious signs at the apex; and 4 were apparent

cures. Lemoine (Sem. Méd., Mar. 27, '95).

In the bacteriological study of cases of sero-fibrinous pleurisy there were found pneumococci in 4 (20 per cent.); staphylococci in 6 (30 per cent.); Eberth's bacillus in 1 (5 per cent.); tubercle bacilli in 3 (15 per cent.); and undetermined organisms in 6 (30 per cent.). The pneumococcic cases are frank, sthenic, and benign in tendency. Those due to staphylococci are more insidious in onset and less frank in their symptomatology. The cases due to Eberth's bacillus occur in the course of typhoid fever, are latent in their symptomatology, and are often somewhat hæmorrhagic. The tuberculous forms tend to be dry and fibrinous. Fernet (La Trib. Méd., Feb. 27, '95).

There can be no doubt that the tubercle bacillus is the most common cause of dry pleurisy and of pleurisy with serous effusion. This view is supported by many considerations. Persons with an inherited tendency to tuberculosis, as well as those with tuberculous disease of the lungs, are specially liable to these forms of pleurisy. Many of those who recover from the effusion afterward suffer from the tuberculous disease, especially of the lungs. This termination is of too frequent occurrence to be merely a coincidence. Many French observers believe that 75 per cent. of all such cases are of tuberculous origin. This estimate is considerably higher than that of English and American observers, but the proportion of cases of tuberculous origin is increasing year by year as the investigation of cases becomes more thorough. Examination of the effusion by culture-methods often gives negative results; but inoculation of the serum into guinea-pigs, where large amounts—15 cubic centimetres or more—of the serum is injected, is much more successful, many of them becoming infected even when the fluid appeared sterile. Purulent ef-

fusion, if sterile, suggests tubercle bacillus as a cause; if not sterile, it is probably always due to pneumococcus, streptococcus, or some other microbe.

Opinion based upon series of 27 cases followed up for 25, 20, 16, 11, 10, and 8 years. None of them became tubercular after attacks of sero-fibrinous pleurisy. Theory of a primary sero-fibrinous inflammation of the pleura upheld. Coriveaud (Jour. de Méd. de Bordeaux, July 22, '89).

Of 101 cases of pleurisy examined post-mortem, 32 were definitely tuberculous and 13 existed in patients with tuberculous lesions of the lungs without any definite proof of the tuberculous character of the pleurisy. By far the commonest forms of pleurisy were sero-fibrinous or fibrinous exudation, secondary to acute disease of the lungs, or occurring at the termination of chronic affections of the heart, arteries, or kidneys. Osler (Trans. Mass. Med. Soc., '93).

The majority of cases of pleurisy find their origin in tuberculosis of the bronchial glands. To illustrate the etiological rôle played by the bacilli a series of experiments conducted on guinea-pigs.

The exudate was obtained from 23 patients who had been in good health when they acquired the pleurisy and in whom no tuberculous lesions could be detected after the most careful examination.

As a result, 15 of 23 animals, or 65.2 per cent., developed tuberculosis, while only 8, or 34.8 per cent., remained healthy. These results indicate that nearly two-thirds of all cases of acute serous pleurisy are of a tuberculous nature. Eichhorst (Corres. f. Schweizer Aerzte, No. 13, '95).

Two hundred cases examined with reference to the questions: Is there an "idiopathic," non-tuberculous, serous pleurisy? Is there an acute rheumatic pleurisy, equivalent to a previous acute arthritis? Are there serous exudates, with pyogenic organisms, which do not become purulent?

Forty-three of the 200 cases were demonstrated to be tuberculous by find-

ing bacilli in the sputum or other products. Nineteen more had the suspicion of tuberculosis in the history. Of the 200 cases only 7 gave a positive result when examined for bacteria. Out of 17 inoculations only two, belonging to the 7 just mentioned, gave positive results. These were: 1 case of sepsis and 1 of tuberculosis. The others were: metapneumonic, 2; so-called idiopathic, 2, 1 of each showing streptococci and 1 pneumococci; 1 following gangrene of the lung with streptococci. The first 2 patients died. In the other 5 the exudates became purulent ultimately. Operation is not always necessary in such cases. Some recover spontaneously.

In all the rest of the 193 cases bacteriological examination was negative. Of 13 cases belonging to the class of demonstrable or suspected tuberculosis, inoculations in guinea-pigs gave positive results in 7. Of inoculations in 12 suspected cases, 3 were negative. A similar proportion was observed in the so-called idiopathic cases, 9 out of 12 causing tuberculosis in guinea-pigs. This confirms the view that most cases of idiopathic pleurisy were tuberculous. Aschoff (Zeit. f. klin. Med., B. 29, p. 440).

Literature of '96-'97-'98.

Tubercle bacilli are transported to the parietal layer of the pleura inclosed in leucocytes. They may almost invariably be found in the acute sero-fibrinous form of tubercular pleurisy, either in the liquid or in the false membrane. Péron (Bull. de l'Acad. de Méd., Oct. 27, '96).

Leaving out cancer of the pleura, all sero-fibrinous pleurisy are grouped into three classes:—

1. Tuberculous pleurisy of the type known as acute, primary, or *a frigore*.

2. Pleurisy from miliary tubercles of the pleura in the course of a general tuberculosis.

3. Pleurisy secondary to lesions of the lung; (a) by subpleural infarcts; (b) by subpleural hepatization; (c) pulmonary congestions. Le Damany (La Presse Méd., Nov. 2, '98).

Pleurisy due to the pneumococcus may

be primary, but is often secondary, to pneumonia. The exudation into the pleura caused by the pneumococcus may be plastic or fibrinous, such as occurs usually in pneumonia; it is occasionally sero-fibrinous, but more frequently it is purulent. The pneumococcus is usually the cause of empyema in children in many of whom no preceding pneumonia can be demonstrated. The pleurisy is usually primary unless an interval of a day or more occurs after the defervescence of pneumonia before the symptoms and signs of pleural effusion set in; but there may be no interval, the empyema beginning before the pneumonia ends, or the interval may be protracted even to several weeks.

The etiology of pleurisy studied in 52 cases. The disease is of bacteriological origin, although the bacteria may not be found in the exudation. The majority of primary, non-tubercular pleurisy considered as due to the diplococcus of Fraenkel. The most frequent cause, aside from these, is the streptococcus pyogenes. Serous effusions containing the latter are much more likely to become purulent than those which contain only the diplococcus. The most favorable prognosis to be given in cases which contain only the Fraenkel diplococcus. Jakowski (Gaz. Lekarska, Nos. 11, 12, '92).

Parapneumonic pleurisy generally begins with the pneumonia, or at least follows its appearance very closely. In most cases the effusion is discovered on the second or third day of the illness, develops rapidly, and may disappear as quickly. It is exceptional to see a parapneumonic serous effusion become purulent. In the very rare cases where it does so, it is not due to pneumococci, but to the ordinary micro-organisms of suppuration: streptococci or staphylococci. Lemoine (La Sem. Méd., Jan. 13, '93).

Streptococcal pleurisy is the typical empyema of the adult. The infection may take place directly from the lung

as from broncho-pneumonia, gangrene of the lung, pyæmic abscess, or tubercle; or from more distant parts, as from ulceration of the œsophagus, abscess in the mediastinum, subphrenic abscess, caries of the spine, etc. The germ may come from the blood in general diseases, as septicæmia, fevers, erysipelas, etc.

Literature of '96-'97-'98.

Study of various reports in staphylococcal pleurisy show that the condition is of extremely slow, irregular, and prolonged course. The fluid is often serous in the early stages, subsequently becoming purulent, but it does not contain flakes of fibrin. Suppuration is usually free. The staphylococcus is not very specific and only tends to develop in those who are already in bad health or who are convalescing from some serious illness. The diagnosis from tuberculosis is often difficult. Lop and Monteux (*Revue de Méd.*, Apr. 10, '98).

Morbid Anatomy.—As in inflammation of serous membranes generally, there occurs hyperæmia, proliferation and desquamation of endothelial cells, exudation of serum, and leucocytes on the surface of the pleura. The pleura loses its polish, partly on account of these changes and partly on account of fibrin, which forms a thin layer on its surface. In more severe cases the fibrin forms in thick, shaggy masses, of which the layers in contact with the pleura are more or less densely laminated. The fibrinous exudate forms on both surfaces, but more densely on the visceral pleura usually because infection generally takes place from the lung.

If the inflammation ceases at this stage we speak of it as a dry pleurisy. The exudate is partly absorbed and partly organized, adhesion of the opposed pleural surfaces resulting. It is probable that in mild cases all the exudate is absorbed, leaving no adhesions or other traces of

inflammation. This is difficult of demonstration, but we know that even severe peritonitis may leave no permanent adhesions, and from analogy we have reason to believe that similar results occur in pleurisy.

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There are, at least, three distinct forms of pleurisy: (1) a form in which "fibrinoid degeneration" occurs along with marked filtration of the pleura by cells; (2) a form in which there is a general increase of the connective tissue of the pleura without marked filtration by cells and without "fibrinoid degeneration" of the connective-tissue fibrils; (3) a form in which the whole thickness of the inflamed pleura consists of highly-vascular and very young cicatricial tissues. Endothelium may be found covering the "false membrane," and the connective tissue of the pleura itself may undergo the change termed "fibrinoid degeneration."

But these changes are not commonly seen. In the greater number of human cases examined all trace of the normal endothelium was lost. W. S. Lazarus Barlow (*Brit. Med. Jour.*, Sept. 3, '98).

In the early stages of tuberculous pleurisy the lesions are not different from those of simple inflammation, excepting for the presence of the bacillus; and, even later, distinct tubercles often do not form. A. N. Péron (*Presse Méd.*, Feb. 19, '98).

SEROUS AND SERO-FIBRINOUS EXUDATION.—In many cases besides the fibrin there is a tangible quantity of serous exudation containing fibrinous shreds. The fluid varies in quantity from a few drachms to an amount sufficient to enormously distend the chest. Unless circumscribed by adhesions the fluid collects at the lower and back part of the pleural cavity, allowing the lung in this situation to collapse by relieving it of the suction-action of the chest, to the extent of the bulk of the fluid. The fluid is yellowish, with a faintly-green

tint, alkaline, and usually highly albuminous. Besides containing large cells from the proliferating endothelium, and a varying number of red blood-corpuscles, the fluid also contains leucocytes in various stages of transformation into pus. The pus-cells usually render the fluid somewhat cloudy and may be so abundant as to convert it into a sero-purulent exudation. The amount of fibrin varies: in some cases it forms only a thin layer on the pleura; in others, besides a thick creamy layer, it forms whitish, curdy masses in the lower part of the fluid.

If the effusion fills the pleural sac the lung will be compressed into a dark airless and even bloodless mass at its root and soon become carnified. In such cases the mediastinum and the heart and large vessels are displaced *en masse* to the opposite side. In left-sided effusions the cardiac impulse may appear near the right nipple and is caused by the impact, not of the apex, but probably of the right auricle and base of the right ventricle. There is probably no rotation of the heart even in the most extensive cases, nor any kinking of the inferior vena cava. (Osler.)

PURULENT EFFUSION.—The character of the effusion is determined by the virulence of the microbe exciting the inflammation and by the resisting powers of the tissues. The effusion may begin as a sero-fibrinous exudate, and later, on account of increased activity in the inflammatory process, become richer in cells until it is altered to a purulent fluid. In most instances, however, the exudation is purulent from the first, especially in streptococcal infection.

The effusion may consist mostly of serous fluid with thick, yellow pus and fibrin-masses which settle to the bottom on standing, leaving the upper parts

clear. In the severer cases the fluid consists of thin, yellow pus, and little, if any, fibrin is deposited on the pleural surfaces. The pus usually has a sweetish odor, but may be fœtid, in most cases from some obvious cause, as a punctured wound, gangrene of the lung, etc.; it may, however, be putrid apart from such causes. In long-standing cases the pleura becomes a dense, grayish membrane one or two millimetres in thickness. The thickening is greatly increased by retraction of the chest-wall, and the density may become almost cartilaginous. When such pleural changes are general, the lung is compressed into a small carnified mass lying close to the spine.

ENCYSTED, OR LOCULATED, EFFUSION may be either serous or purulent, more frequently the latter. Such circumscribed effusions frequently result from perforation of an abscess into the pleura, adhesions preceding the perforation. Instances are not infrequently met with where hepatic and subphrenic abscesses perforate the diaphragm. Loculated effusions are most common at the back, but may occur anywhere. Not infrequently they occur in the interlobar fissure, being probably usually due to tubercular deposit, which should be carefully sought for in this location. Purulent collections in this situation may attain large dimensions and look like abscesses of the lung. These loculated collections are very difficult of diagnosis, and justify the free use of the aspirating needle.

HÆMORRHAGIC EFFUSIONS are occasionally met with and are usually due to tuberculosis of the pleura, less often to carcinoma. They may occur also in Bright's disease, cirrhosis of the liver, and in malignant cases of the eruptive fevers. They are also occasionally met with in persons apparently free from any

of these diseases, although even these may be tuberculous.

Prognosis.—The pleura not being a vital organ, disease of it can prove fatal only (1) from septic absorption, (2) from extension of disease to other structures, or (3) from the volume of the exudate interfering with the functions of neighboring organs.

The liability to sepsis depends on the nature of the infective organism. Streptococcal infection is the most grave, as even after free drainage is established it may give rise to general sepsis. Pneumococcal cases usually run a favorable course, a few cases recovering after aspiration alone. In tuberculous cases the exudation is often sterile; if the infection is confined to the pleura, they do well.

Literature of '96-'97-'98.

Extreme view that all the subjects of pleurisy are doomed to die of tuberculosis, and teaching that every case of pleurisy is an initial tuberculous manifestation, not accepted. Even among those pleuritic patients who ultimately succumb to tuberculosis, often after a considerable number of years, it is by no means certain that the pleurisy was tuberculous from the beginning and constituted the first manifestation of bacillary infection.

The lungs and pleura subsequent to pleurisy rarely can regain complete integrity. More often there is a persistence of adhesions which limit the respiratory movements and expansion of the lung. In consequence of these adhesions and limitation a weak point results. Exposed like others to numerous causes of tuberculous contagion, these patients are less resistant. This vulnerability of the respiratory apparatus is not observed only after pleurisy.

It follows, therefore, that if a patient finally dies of tuberculosis we must not conclude that the latter had existed from the time of the pleural effusion. Jacoud (*Med. Bull.*, May, '96).

In sero-fibrinous pleurisy the danger is from the bulk of the fluid, the occurrence of double effusion, and from the occurrence of pericarditis. Even large effusions may absorb rapidly, but are more likely to do so after aspiration of part of the fluid.

Twenty-seven cases in which pleurisy resulted in sudden death, the patients having no warning of their approaching dissolution. The chief lesions which might produce sudden death in pleurisy are thrombi and emboli of the pulmonary artery, œdema of lung of sound side, and diseases of the heart-muscle. Weill (*N. Y. Med. Jour.*, Feb. 1, '90).

In children and young adults, acute primary sero-fibrinous is rarely fatal, absorption taking place within a few weeks. Tuberculous cases are, of course, less favorable, as the bacilli usually invade other structures, especially the thoracic glands.

In advanced age serous effusions are much less frequent and the prognosis is less favorable.

Treatment.—In all cases rest in bed is necessary, and should be continued until the acute symptoms abate. In mild cases this care is necessary on account of the frequency of the tuberculous origin of this disease.

In mild cases of dry pleurisy little treatment is needed. If pain is troublesome, hot applications or mild counter-irritants may be sufficient to give relief; if more severe or if cough is troublesome, small blisters over the seat of pain may suffice. Much relief in these as well as in more severe cases may be obtained by immobilizing the side by applying overlapping strips of adhesive plaster extending from the spine to the sternum, the first strip being applied at the end of a forced expiration.

In cases of more severe pain six to ten leeches may be applied if the patient

is in ordinary robust health; but they should not be used in the young or the aged. The bleeding may be encouraged by hot fomentations or a large poultice. After the bleeding has ceased, a firm bandage applied to restrain the movements of the chest may give relief, or even the adhesive plasters may be used.

Ice-bags applied over the affected area and kept in place by a bandage often give equally good relief, but heat is more agreeable to many.

In the more severe cases hypodermic injections of morphine are the most effective means of obtaining relief.

If cough is troublesome, it may be relieved by small doses of morphine or codeine. For the fever, if high, sponging with water as cool as can be borne usually suffices.

When there is moderate sero-fibrinous effusion, in addition to these means, purging with concentrated saline solution may be tried in ordinarily robust patients. For this purpose half an ounce or more of saturated solution of magnesium sulphate is given in the morning before food is taken, the object being to excite copious liquid evacuations from the bowel in order to deplete the blood and thus lead to rapid absorption of serum from the lymph-spaces generally and among them, the pleural cavity especially. During the administration of the saline, the food should be dry and the quantity of liquid taken very small.

At a later period potassium iodide is recommended, but is of doubtful efficacy. Painting the affected side with iodine or the application of a succession of small blisters is advised and sometimes does good.

Literature of '96-'97-'98.

In eleven cases of serous pleurisy disappearance of the exudations was caused by painting the skin with guaiacal. No

unpleasant objective by-effects were noted. As a rule, from five to seven applications sufficed to bring about the disappearance of the exudation. In a few cases a fall of 0.36° to 3.6° F. in temperature was observed after the application of the guaiacal, but a rise to the original or even a higher temperature soon followed. Prossorowski (*Deut. med. Woch.*, xix, p. 265, '98).

Should absorption not begin at the end of ten days or two weeks, aspiration of the fluid is the most rational and effective method of dealing with it. In the case of purulent exudation removal of the pus should, of course, be resorted to by aspiration, or incision and free drainage at once it is known to be present. Neither should there be any delay in aspirating very large serous effusions with evidences of intrathoracic pressure or with dyspnoea, lest symptoms of heart-failure suddenly set in.

Literature of '96-'97-'98.

So long as there is a fair prospect of absorption's taking place, it is generally better in the interest of the patient to leave the effusion alone. If, however, paracentesis is rendered necessary, a complete bacteriological examination of the fluid should certainly be made. K. Fowler (*Clin. Jour.*, Feb. 3, '97).

Serous pleurisy which has not been tapped is recovered from better and more completely than one which is tapped. Even at the end of two months or more after paracentesis, some dullness, diminished vocal resonance, and feeble respiration persist. The cases of serous pleurisy are tubercular and it is thought that paracentesis withdraws from the organism a fluid which is its principal defence against the invasion of the bacillus. It favors the absorption of the residue of this liquid, and together with this the germs which it contains. In this way it hastens tuberculization of the lungs. Talamon (*La Méd. Mod.*, Mar. 9, '98).

During the pyrexial period aspiration is said to be very liable to be followed by a reaccumulation of the exudate.

It is often observed that the withdrawal of a comparatively small quantity of even a very large effusion is followed by rapid absorption of the remainder. This is probably due to the removal of excessive pressure from the pleural lymph-vessels, allowing of their dilatation and of a free flow of lymph.

In nineteen cases of pleural effusion the removal by aspiration of a single cubic centimetre influenced favorably the absorption of the fluid and caused increased excretion of urine. Effect of this treatment is due to traumatic irritation. *Jordan (Pester med.-chir. Presse, No. 25, '94).*

In small effusions the puncture with the aspirator-needle must, of course, be made over the seat of effusion. When the effusion is large, so that the pleural cavity is nearly full, the best place for puncture is outside the angle of the scapula or in the middle line of the axilla, on a line with or a little below the nipple; that is, about the seventh intercostal space; as here the intercostal spaces are wide and the chest-wall thin. These places are safe unless the lung is adherent. The suction of the aspirator should be sufficient only to maintain a gentle flow of fluid. The flow is to be stopped as soon as the suction causes frequent cough, pain in the chest, or blood to appear in the flow.

[Little is to be expected from medical treatment of serous accumulations in the chest. The aspirator, applied at the upper edge of the fifth or sixth rib on the axillary line, has proved efficient in relieving most cases of serous effusion in the pleural cavity. *J. McFADDEN GASTON, Assoc. Ed., Annual, '90.*]

Literature of '96-'97-'98.

In cases of serous or albuminous expectoration after paracentesis for pleural effusion, the duration is usually not more than an hour or two, though extreme

limits of forty-eight hours have been reported. The fluid varies from a few ounces to three pints, and contains much mucin and little albumin. The physical signs are those of congestion of the lungs. The result is rarely fatal. *West (Brit. Med. Jour., Apr. 18, '96).*

The pain of puncture may be relieved by previously freezing the skin or by infiltration anaesthesia. It is best to incise the skin with a bistoury and then to introduce the needle with a sudden thrust, so that it may penetrate the layer of fibrin on the costal pleura and not carry it away from the chest-wall. Frequently the needle becomes obstructed by a fragment of lymph in passing through the fibrinous layer or by particles floating in the serum. Occasionally a case is met with in which the fluid will not flow on account of the lung's being so bound down that it cannot expand. In such we must be content with the few ounces that can be withdrawn.

Pleurisy is always to be treated as a serious disease; particularly if it is suspected to be of tuberculous origin special efforts are to be made to secure complete absorption of the exudation and full re-expansion of the lung. Nutrition should be maintained at the highest point possible by favorable sanitary conditions, by an abundant supply of suitable food, and by such medication as the special features of the case call for. Gradually increasing doses of creasote have appeared to be beneficial in some cases. Out-of-door life is as necessary in this as in other forms of tuberculosis. If retraction of the chest is progressive after disappearance of the fluid, residence in high altitudes may be desirable to stimulate expansion of the chest by breathing rarefied air.

Much may be done by the systematic practice of deep inspiration followed by slow, obstructed expiration. For chil-

dren this may be effected by blowing bubbles or by having two large bottles, one empty and the other filled with water, connected by tubing and a suitable tube with mouth-piece inserted into the full bottle and the child encouraged to force the water over into the empty bottle by blowing into the full one. This may be done several times a day.

Literature of '96-'97-'98.

Every chronic inflammatory process in either lung or pleura that is not already infected with tubercle bacilli is in constant danger of becoming so. Hence, all such subacute processes should be carefully watched and treated until every trace of disease has disappeared. Fluid in the pleural sac compresses the lung so that respiration must be carried on upon the sound side; the muscles on the diseased side atrophy from disuse. If these atrophic muscles are not strengthened by proper gymnastics a feeble respiratory action is present, especially at the base, and hence becomes a fertile field for the growth and multiplication of tubercle bacilli. All fluid accumulations should be gotten rid of as soon as it is evident that Nature will not absorb them. The reappearance of fever, after it has disappeared from the acute stage, is strongly suspicious of the presence of pus, which should be promptly evacuated and the cavity thoroughly drained. James (Penna. Med. Jour., Nov., '97).

EMPHYEMA, OR PURULENT PLEURISY, is to be treated by free incision and drainage. A few cases in children get well after one or two aspirations, but if pus reaccumulates free drainage should at once be effected. If the exudation is very large it is wise to remove much of the pus by aspiration and effect free drainage a day or two later. Even in the most desperate cases free drainage should be resorted to.

In order that drainage may be free it is usually best to resect a portion of a rib.

If the exudation is being thoroughly evacuated through the drain, the discharge diminishes in a few days. The temperature should fall after the discharge of pus. Should it not do so either the drainage is ineffective or some other disease is present. It is rarely, if ever, desirable to wash the pleural cavity with any kind of fluid. Complete drainage suffices even in foetid cases; if foetus remains, the drainage is ineffective and washing out does not help it. Further, injections of even plain water or normal saline solution are dangerous. There may be sudden syncope, or there may be an ulcer on the pleural surface of the lung through which the fluid escapes into the bronchi and causes great shock or suffocation by obstructing the smaller bronchi.

It is superfluous to wash out the pleural cavity. Personally it was found necessary once in 399 operations upon 250 patients. It is a serious and dangerous procedure. H. B. Bowditch (Amer. Lancet, Dec., '89).

Literature of '96-'97-'98.

Personal method of substituting salt solution for the effusion of pleurisy tried in 52 cases, all followed by marked relief and prompt recovery. Thoracentesis is first performed, and as the effusion is gradually aspirated it is replaced by physiological salt solution, which prevents the collapse of the organs into the empty pleura, while the solution is gradually absorbed and exerts a general tonic and local antiseptic effect. Lewaschew (Therap. med. Woch., June 23, '96).

The so-called incurable cases of purulent pleurisy can usually be cured by the siphon, as recommended by Revilliod, of Geneva. The suction of the valve causes expansion of the lung, while the continuous aspiration renders washing out of the cavity less necessary. C. G. Cumston (Boston Med. and Surg. Jour., Nov. 22, '96).

Value of treating cases of empyema, after operation, by submerging the body

of the patient in a bath of warm water emphasized. The force of the inflow of water with each inspiration is much greater than that obtained by means of any ordinary irrigator, and expiration drives out many tough, stringy masses which had not been affected by irrigation previously employed. The bath should be given at a temperature of 100° F., and the water should be rendered aseptic by previous boiling. In some cases an antiseptic may be added. The quantity of water should be sufficient to reach a few inches above the wound, and the child should be kept in it from ten to twenty minutes, until the water, with each expiration, returns clear. Adams (*Archives of Ped.*, Aug., '97).

Of 56 consecutive cases of empyema operated upon by primary exsection of a rib, 18 died: a mortality of 33 per cent. Sixteen of the deaths, however, were from causes which apparently had no connection with the surgical procedure. Scharlau (*Archives of Ped.*, Aug., '97).

Propriety suggested of treating purulent effusions occurring in pneumothorax in the same way as empyemata, even where the pus is not fœtid, as tending to the prolongation of life and the greater comfort of the patient. In fœtid effusions there is no choice; such should certainly be evacuated and drained. As for the serous effusions, there are good grounds for thinking that the perforation in the pleura has become sealed up; the removal of a portion of the fluid need not be looked upon as inadmissible. Finlay (*Brit. Med. Jour.*, Jan. 8, '98).

The presence of air does not affect the principles of treatment in case of fluid in the pleural cavity. West (*Med. News*, Jan. 8, '98).

In many cases of operations for pyothorax some rise of temperature takes place after the operation. Among the many causes to which the rise may be attributed are intoxication by absorption from iodoform or carbolic-acid dressings, constipation, secondary and extrathoracic abscesses, infection from some specific contagion, an unresolved lobar pneumonia or broncho-pneumonia, gen-

eral septic infection, and, sometimes, deep-seated multilocular accumulations of pus not reached by the primary operation. There is also a class which do well for several weeks, and then show an irregular rise of temperature, although no local or general complications can be detected. In these cases the drainage-tube should be removed and the patient taken out-of-doors in spite of the fever. The successful management of pyothorax is not alone a matter of incision and drainage, but often calls for accurate clinical investigation and observation. Caillé (*Archives of Ped.*, Aug., '98).

Diaphragmatic Pleurisy.

In rare cases acute inflammation of the diaphragmatic pleura is characterized by extreme pain and distress. As inflammation of the pleura in this region without marked symptoms is of frequent occurrence,—for example, in all cases of pneumonia of the base of the lung,—the extremely distressing symptoms occurring in rare cases must be due to other causes than the inflammation of the pleura. The most probable cause is the extension of the inflammation to the substance of the diaphragm, rendering it sensitive to every movement.

Symptoms.—Pain is the most important symptom. It is referred to the line of insertion of the diaphragm or to the epigastric or hypochondriac regions, and over these areas there is usually much tenderness to pressure; also to pressure upward on the liver. The breathing is rapid, and, as far as possible, costal. The facies is anxious and the suffering evidently extreme. The temperature is high and pulse rapid. If the inflammation is confined to the diaphragmatic pleura there are no signs of exudation; in many cases, however, the inflammation extends upward later and presents definite signs of pleurisy. This is well illustrated in the case of a young man

whom I saw with Dr. Cleland, of Toronto. There was extreme pain in the splenic region, but without any signs of pleurisy until the fifth day, when friction-rub was made out at the lower margin of the lung in the anterior axillary line. Later empyema developed, and the germ present proved to be the streptococcus. There was possibly also a perisplenitis. A good recovery was made.

A second case—a young man, also—seen with Dr. Shearp, of Milton, leaves no doubt of inflammation of the diaphragm. The left pleura was attacked, apparently also with consolidation of the lower lobe of the lung. Pain and distress were very severe. Three days later the lower lobe of right lung became affected and the pain was agonizing. Friction-rub was very marked. In two days signs of inflammation of the perihepatic tissue developed, with marked friction down nearly to the umbilicus. The temperature was high and general condition grave, the pain being almost unendurable. There was occasional cough, and the only expectoration obtainable gave a pure culture of the staphylococcus. Death took place on the twelfth day; an autopsy was not permitted.

The chief cause of extreme pain in this case was, without doubt, the inflammation of the diaphragm.

[Diaphragmatic pleurisy may be mistaken for pleurodynia or a tender point of neuralgia. Both sides are affected alike frequently. The determining cause is a microbe infection. The exudate may be purulent or subfibrinous. The pleurisy may be primary or secondary. A very constant and characteristic sign is the so-called diaphragmatic button: a tender spot two fingers' length from the linea alba at the level of the tenth rib. It can be found even when there is no spontaneous pain. There is also tenderness along the attachment of the diaphragm, and another very tender spot on this line near the spinal column, as

well as along the course of the phrenic nerve. Physical signs are: depression of the tenth rib, enlargement of that side of the chest at the same level, decrease of vocal fremitus, and absence of respiratory murmur. Other symptoms are those of ordinary pleurisy. J. T. WHITTAKER, Assoc. Ed., Annual, '94.]

Chronic Pleurisy.

There are two forms of this affection: one with and one without effusion.

1. Chronic Pleurisy with Effusion.—

This may follow acute sero-fibrinous pleurisy. Paracentesis may be performed from time to time, but the fluid reaccumulates. The exudate continues to be serous, with, in some cases, a large deposit of gelatinous material on the pleural surfaces. After some months or even years some retraction of the chest may take place, showing that the fluid has been partly absorbed. There may have been no symptoms beyond some dyspnoea on exertion, but lighter occupations may be pursued with comfort.

In other cases the affection is *latent* from the beginning. The onset is not marked by any symptoms that attract attention. With the accumulation of fluid, dyspnoea appears on severe exertion and becomes more easily provoked as the fluid increases. Inquiry into the history usually discovers more symptoms than the patient was aware of. He was content to attribute his failing strength to temporary causes without making an analysis of his symptoms. Clubbing of the fingers and toes may be marked.

Probably the great majority of these cases are of tubercular origin, analogous to cases of peritonitis with similar pathological changes and a similar history.

Aspiration should be resorted to in these cases and repeated as often as the fluid reaccumulates, as much of the fluid being removed as will flow without distress to the patient. Later, when it seems

useless to repeat the aspiration, active counter-irritation to the chest may be continued and short courses of alteratives given. Every means possible to improve the general health should be adopted, as an out-of-door life, pulmonary gymnastics, nutritious diet, and change of residence. A sojourn in high altitudes does good in some cases, being followed by re-expansion of the lung.

If the exudation becomes purulent, it should be drained, ribs being resected if necessary, unless free incision is contra-indicated by the existence of pneumothorax.

2. Chronic Dry Pleurisy.—This condition may be preceded by pleural effusion or develop gradually as a dry pleurisy. (a) In the first class after the absorption of the fluid there remains on the pleural surfaces more or less fibrinous deposit, some of which is gradually absorbed and the remainder becomes organized into connective tissue. This restricts the respiratory movement to some degree, causes some dullness on percussion, and feebleness or absence of respiratory sounds and, it may be, some retraction of the chest-wall. These results are more marked in the purulent cases, especially in those in which there has been long persistence of discharge. The pleura in these cases is a thick mass of connective tissue surrounding an airless carnified lung. In less marked cases there may be bronchiectasis.

(b) **PRIMITIVE DRY PLEURISY.**—Pleural adhesions very often occur without any history indicating pleurisy. It is rare not to find some adhesions at a post-mortem examination. They may be local or general and be due to so slight a degree of exudation as to yield no signs on examination except Litten's diaphragm phenomenon. There may be no interference with respiratory func-

tion. Such adhesions may be due to acute or subacute pleurisy. In more considerable thickening there will be inspiratory retraction of the interspaces, loss of resonance on percussion, and feebleness or absence of the respiratory sounds.

The late Sir Andrew Clark was of the opinion that chronic dry pleurisy may lead not only to great thickening of the pleura, but to extension of the inflammatory process to the lung, causing marked fibroid changes in it: pleurogenic cirrhosis. Great thickening of the pleura and fibrosis of the lung often co-exist; but that the latter results from the former is open to question.

Similar changes occur in cases of chronic pulmonary tuberculosis, and for the production of the pleural thickening Fowler offers the following explanation: "Whenever a retracting lesion is present in the lung and is situated sufficiently near the surface, one or other of two events always happens: either the pleura becomes thickened or emphysematous bullæ are formed on the surface of the lung. If there is no lung-tissue between the retracting lesion and the pleura capable of undergoing distension, the former change occurs; if there is, the latter lesion is produced."

This applies to the non-tubercular cirrhosis of the lung, as well as to the extreme thickening of the pleura in chronic pulmonary tuberculosis.

ALEXANDER MCPHEDRAN,

Toronto.

PLUMBISM. See LEAD.

PNEUMONIA, CATARRHAL, OR BRONCHO-PNEUMONIA.

Synonyms.—Lobular pneumonia, vesicular pneumonia, disseminated pneumonia, broncho-alveolitis, broncho-alve-

olar catarrh, peribronchitis (Balzer), capillary bronchitis, suffocative catarrh.

Definition.—An inflammation of the terminal bronchus and the air-vesicles which make up a pulmonary lobule.

Varieties.—There are recognized two principal types of the disease: the *lobular*, in which the dissemination of the morbid process and the distinctly lobular involvement of the alveoli can be readily demonstrated, and the *pseudolobar*, in which the massing and extent of the affected areas gives a resemblance to the consolidation of croupous or lobar pneumonia. To this may be added that type at one time clinically distinguished as *capillary bronchitis*.

Symptoms.—As the severity of the pathological processes varies greatly in different cases, the symptoms have corresponding variability. In some cases the general symptoms are so slight that the patient walks around attending to his usual affairs, or, if a child, plays about, with but slight complaint except of cough, or as is likely to be said of "cold." This is not infrequent at the beginning of an attack of influenza, which may afterward prove quite severe, if untreated to; and it is the rule in the early stages of tuberculosis. The mistake of looking upon the case as one of simple bronchitis may thus easily be made.

Elevation of temperature, often surprisingly great, will, however, be discovered upon thermometrical examination; percussion and auscultation of the chest will reveal some of the characteristic physical signs. There may be slight pain in the chest, especially if there be pleural involvement, and this is more common in influenza and tuberculosis than in other varieties of the affection. In other cases the symptoms, though rarely, except in influenza, sudden in onset, become quite severe from the first; there

is prostration, with high fever, rapid pulse, headache, restlessness, pain in the chest, and respiratory distress, with quickened breathing, cough, and usually expectoration, though in children in whom the morbid process ensues as a sequel of some infectious fever the cough is at first dry and harsh. In infants and young children, moreover, there is often difficulty or even impossibility of expectoration; so that the moist sounds of air passing through the mucus retained in the windpipe and bronchi may be audible even to the casual observer; and there is then considerable distress in respiration, often approaching suffocation, thus giving rise to the common synonym of capillary bronchitis: suffocative catarrh. The matter expectorated is not, as a rule, blood-stained, but varies much in its physical characteristics. It is usually mucoid; sometimes, and especially in tuberculosis, muco-purulent; and in influenza often resembles boiled sago sprinkled with coal-dust. I have come to look upon this black discoloration of the influenzal sputum as quite characteristic. The appetite is impaired, the tongue coated, the lips red and dry at first, afterward cyanotic. The skin is dry and hot.

Physical examination at first, especially in children, may fail to reveal dullness or even blowing breathing, but there will be discovered, scattered over both lungs and often more frequent and more extensive at the bases, showers of fine subcrepitant râles. Sibilant rhonchi may likewise be heard. In the course of a day or two, sometimes later, scattered areas of dullness associated with bronchial or vesiculo-bronchial breathing, and moist râles, and sometimes with absence of breath-sounds, indicating atelectasis, are discovered. Of these some are constant and others appear and disap-

pear: shifting dullness. They may be numerous and small or few and extensive; sometimes they are massive, involving the greater portion of a lobe or of a lung. These massive areas are constant, and over them the breathing is distinctly bronchial, closely resembling that of lobar pneumonia. Bronchophony may be present. In tuberculosis, what I have termed "the isolated apex sibilant râle" is quite characteristic. An apex pleuritic friction is sometimes heard; and usually as the case progresses there develop characteristic crackling, and the liquid râles indicative of softening.

As these signs develop, indicating extension of the local morbid processes, the symptoms become correspondingly severe. Dyspnoea increases and the respiration-rate rises, with children reaching sixty or seventy, with adults rarely exceeding fifty, and usually remaining below that number. Cyanosis now becomes manifest. There may be suprasternal and infrasternal retraction. At first, in severe cases, the children exhibit great restlessness and anxiety, obtunding of sensation takes place, drowsiness increases, and, while the breath becomes more gasping, the efforts to obtain air diminish. The heart becomes weaker, the right ventricle is evidently distended; the pulse is small, feeble, and fluttering; and death may occur from cardiac paralysis or from exhaustion. Sometimes there is delirium, cephalalgia, retraction of the head, and tenderness of the scalp and neck, apparently indicating meningeal complications, and convulsions may occur; at other times there is constant or intermittent delirium, with jactitation, and this seems to be rather toxæmic than due to cerebral inflammation.

Literature of '96-'97-'98.

Two forms of laryngeal spasms observed complicating cases of broncho-

pneumonia: one in which the mediastinal lymph-nodes were large enough to compress the recurrent laryngeal nerve; the other in which the lymph-nodes were not enlarged. The spasm can only be explained as reflex, due to the lesion in the lung-parenchyma. Variot (*Jour. de Clin. et de Thér. Infant.*, vol. iv, No. 32, '96).

Catarrhal pneumonia may be divided into three groups: 1. A primary one in older children not suffering from any exanthematous disease. 2. That following infectious diseases accompanied by inflammation of mucous membranes. 3. That met with in cachectic children, due to bad air, poor food, and in rachitis of the thorax.

In the first group we encounter high fever, in the second a long-continued fever, and in the third no fever. We occasionally elicit dullness over both lower lobes of the lungs in pneumonia, accompanied by bronchial breathing in the upper lobe, and this happens in catarrhal pneumonia, which might, therefore, easily be taken for tuberculosis. In severe disease of the lower lobes the upper do not expand well, so that quiescent air-columns are formed. Auffericht (*Der Kinderarzt*, viii, p. 220, '97).

Four clinical types of infantile pneumonia recognized: (a) complete consolidation of lobar distribution, without signs of bronchial catarrh; (b) with no sign of consolidation, bronchial catarrh being generally distributed over one or, frequently, both lungs; (c) with bronchial catarrh and some areas of incomplete consolidation of lobular distribution; (d) with bronchial catarrh and larger areas of incomplete consolidation of lobar distribution. The differentiation of the last three types depends to a greater or less extent upon the degree of accompanying consolidation. The acute pneumonia of infancy and early childhood is a bronchial pneumonia in the majority of cases. James Carmichael (*Brit. Med. Jour.*, Oct. 15, '98).

Recovery may take place even in apparently desperate cases, and the symptomatic changes may be as sudden as in

lobar pneumonia, though usually the process is gradual, but rapid. The duration varies from about ten days to about three weeks. In cases delayed beyond this the suspicion of tuberculosis or localized empyema becomes strong. Some cases, however, which are not clearly tuberculous, run a remittent or subacute course, and others gradually take on a chronic type.

Diagnosis. — There used to be much written concerning the differential diagnosis of capillary bronchitis and broncho-pneumonia. Post-mortem investigation has shown that the differentiation is impossible, for the two conditions usually co-exist. The difference is symptomatic only, and affects treatment only as this is guided by symptoms. The chief difficulties in diagnosis are to determine whether or not lobar pneumonia exists in a case presenting massive areas of dullness and to determine whether or not a case of recognized broncho-pneumonia is tuberculous. The recognition of influenza as the general condition is also important.

LOBAR PNEUMONIA. — As to lobar pneumonia, it is to be remembered that this is less frequent, though not altogether rare in the aged and in children under five years of age. Between five and sixty there is little diagnostic dependence to be placed on age. The mode of onset is different, lobar pneumonia developing abruptly with chill and lobular pneumonia coming insidiously and usually as a secondary infection. Lobar pneumonia is usually one-sided and limited; broncho-pneumonia is usually scattered over both lungs. Even when lobular foci are massed, it is more common to find the other side involved than in lobar pneumonia. Some shifting dullness is usually found in broncho-pneumonia. The rôles of lobular pneumonia are rather

subcrepitant than crepitant and the ringing râle is much more frequent than in lobar pneumonia. Rusty sputum is the rule in lobar pneumonia, the exception in lobular pneumonia. Lobar pneumonia terminates by crisis from the fifth to ninth day; broncho-pneumonia is more prolonged and subsides by lysis.

TUBERCULOUS BRONCHO-PNEUMONIA.

—This form is much more common in adults and children than is commonly supposed. At Jefferson Medical College Hospital, where I saw many children and adolescents, I made inquiries as to the antecedents of many of the cases, and found that there could be separated a group of cases of *recurrent broncho-pneumonia* which was almost invariably tuberculous, and probably had been such from the outset. I have also seen many cases of recurrent fever and cough in young people, without physical signs other than of seeming bronchitis which I am sure are tuberculous and explain the numerous cases of healed and "latent" tuberculosis reported from the dead-house. Indeed, so far from feeling that I am called upon to establish the correctness of the suspicion of tuberculosis in cases in which this arises I am beginning to feel that the burden of proof rests on the side of exclusion. When a case is far advanced, microscopical examination of the sputum showing lung-fibre or tubercle bacilli clinches the diagnosis. Unfortunately, these signs are not available early and the diagnosis is often exceedingly difficult and doubtful. The points on which more or less reliance may be placed are as follow: 1. The course of the fever, which is usually remittent in simple broncho-pneumonia and often hectic or irregular in tuberculosis, though I have seen it sustainedly high and falling by crisis in cases undoubtedly tuberculous. Sometimes the temperature is of the inverse

type. 2. The duration of the case, which is more prolonged in tuberculosis, passing into a chronic or subacute course, though death at times occurs early. These cases form the group of *rapid consumption* in young adults, though not rarely recovery or arrest takes place. 3. The antecedents; that is, the personal and family history of the patient. Heredity plays a marked influence; so too do causes affecting the health of the parents, even though they themselves do not become tuberculous. Broncho-pneumonia following typhoid fever in a young adult is almost invariably tuberculous; and frequently does tuberculosis supervene upon the catarrhal pneumonia of measles and of influenza. 4. The physical signs are likely to be more pronounced in tuberculosis. There is some apical impairment. Crepitant and subcrepitant râles in the middle of a lung are more common. Sibilant râles in isolation are characteristic. As the case proceeds, the signs of breaking-down become evident.

INFLUENZA is usually recognizable by the suddenness of the attack, by the great prostration, by the severe headache, by the cutaneous hyperæsthesia and muscular pain, and by the disproportion between the great respiratory distress and the comparative paucity of physical signs. In cases of gradual onset and of extensive pulmonary involvement the diagnosis is much more difficult and depends upon the general association of symptoms. One point in favor of influenza in a given case would be the fact that a comparatively high fever—104° or 105° F.—in an adult is borne with little discomfort, the patient perhaps being scarcely conscious of fever. The character of the sputum, its sago-like appearance, is also significant.

Literature of '96-'97-'98.

At St. Mary's Free Hospital for Children, New York, cases in which the physical signs are those of bronchitis, but in which the children appear unusually sick and have a temperature ranging above 102.5° in the axilla or in the groin, are regarded as possible cases of broncho-pneumonia and are treated accordingly. George M. Swift (*Archives of Ped.*, Apr., '96).

Etiology.—Broncho-pneumonia is sometimes an independent affection arising from "cold" or from direct irritation by smoke and noxious vapors and gases, and, in cases of such origin, it may likewise be associated with or arise by extension from inflammatory processes in the upper air-passages. It may be caused by chloroform and less often by ether administered for surgical anæsthesia in the presence of artificial light by combustion.

It may arise from purely local infection by agents recognized and not recognized, and probably not specific. It may occur in extension from bronchitis of any origin.

It is, however, usually met with as a complication or sequel of one of the infectious diseases, and especially of those of childhood. Even when it is the only or most prominent manifestation of the existence of infection,—as, for example, in influenza or tuberculosis,—it is to be regarded as secondary.

It may be associated with, or follow, measles, scarlet fever, small-pox, whooping-cough, influenza, tuberculosis, erysipelas, dysentery, meningitis, and typhoid fever.

It also occurs from the aspiration of food (schluck-pneumonia, deglutition pneumonia, inspiration pneumonia) or infectious materials in cases of anæsthesia or paralysis of the larynx, in coma of any origin, in malignant disease of the larynx and œsophagus, following hæ-

moptysis, following operations about the mouth and upper air-passages, and in some cases through the inspiration of matters from a vomica or from a bronchiectatic cavity, or, in exceptional instances, from the rupture into the lung of a purulent collection in the pleura, liver, or elsewhere.

Tuberculous broncho-pneumonia is the most common and most fatal form. Next in frequency is infectious broncho-pneumonia associated with the diseases of childhood, which, according to distinguished pædiatric authors, causes more deaths than do the fevers themselves. Rickets and diarrhœa are likewise mentioned by authors among the predisposing causes affecting children. Thus, while the disease occurs at all ages, it is much more frequent in childhood and infancy. Old age may likewise be considered a factor in creating susceptibility to the disease; and it occurs in association with the various diseases and degenerative conditions incident to the decline of life. At all ages the disease is most prevalent among the poor.

It is, therefore, essentially a morbid process occurring in persons of lowered or innately poor vital resistance; and in conditions which favor mechanically the entrance of infectious material into the bronchi.

Bacteriology.—Apart from the tubercle bacillus, the organisms most frequently found in broncho-pneumonia are the micrococcus lanceolatus, the streptococcus pyogenes, the staphylococcus aureus, the staphylococcus albus, the bacillus pneumoniae of Friedländer. In cases of diphtheria the Klebs-Loeffler bacillus is frequently found; and in influenza Pfeiffer's and other organisms have been reported. It is rare for pure cultures to be found except in the case of the pneumococcus, which is most frequently asso-

ciated with the pseudolobar type of the disease, the streptococcus being most common in the lobular type. Mixed infection is the rule. Wright and Mallory have described a new capsular bacillus found by them in the lungs of a man who, three weeks after diphtheria, died with severe broncho-pneumonia (see *colored plate*).

Literature of '96-'97-'98.

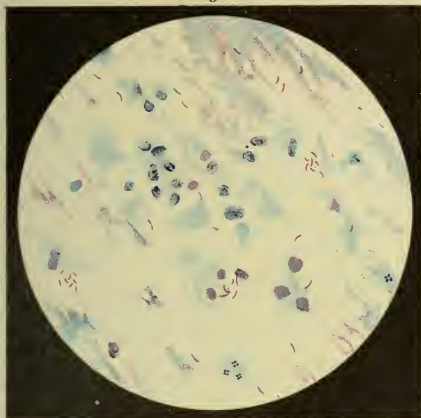
The following conclusions are submitted: 1. That the primary and secondary broncho-pneumonias have a different bacteriological origin. 2. That secondary broncho-pneumonia is, for the most part, due to streptococcic infection derived from some source in connection with the air-tubes, throat, and mouth. 3. That primary broncho-pneumonia is of pneumococcic origin. 4. That pneumococcic inflammation occurs with almost equal frequency in the child and the adult. 5. That pneumococcic inflammation takes a different form in each,—in the adult producing massive consolidation, and in the child disseminated patches of consolidation. Samuel West (*Brit. Med. Jour.*, May 28, '98).

In the acute pneumonia of childhood bacteriology demonstrates that the pneumonia of infancy can in no sense be considered a specific disease, in the sense that it is due to any special organism, as similar, if not identical, pathological changes are produced in the lung-tissues by various organisms. The reason why the same infection that produces a catarrhal pneumonia in infants should produce a fibrinous pneumonia in adults or in children over five years of age is explained by the fact that the alveoli of the lung are not fully developed until about the fifth year of extra-uterine life.

Catarrhal pneumonia is essentially the pneumonia of infancy. Carmichael (*Edinburgh Med. Jour.*, Aug., '98).

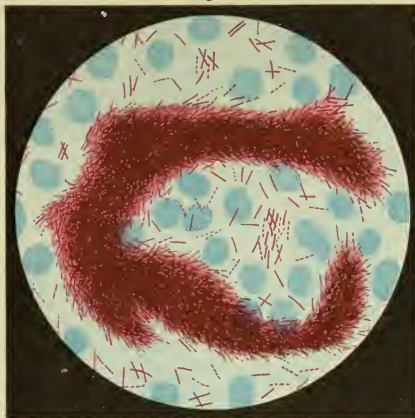
Morbid Anatomy.—The appearances presented by the lungs in cases of broncho-pneumonia are complex, consisting in inflammatory changes in the bronchial tubes, and in pulmonary consolidation, both lobular and more extended. Some

Fig. 2.



Tubercle bacilli (sputum).

Fig. 3.



Tubercle bacilli (urine).

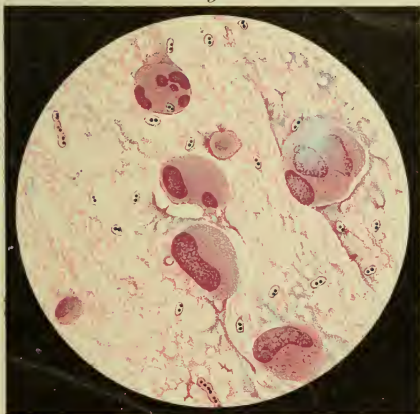
Fig. 1.



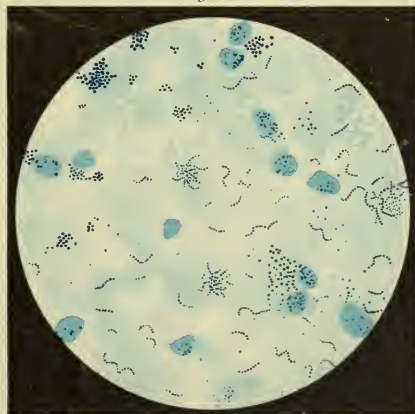
Capsulated bacilli of Catarrhal (Broncho-) Pneumonia (Wright & Mallory).

Fig. 4.

Fig. 5.



Diplococcus Pneumoniæ.



Staphylococci and Streptococci.

Figures 2,3,4,5, from "Microskopie und Chemie" (Lenhartz) Julius Springer, Berlin.

of these pulmonary changes in both varieties are due to collapse and some to vesicular inflammation, lesions which are at times difficult to distinguish from one another, and they also give rise to considerable diversities in the aspect of the lungs.

The mucous membrane of the bronchial tubes is swelled, reddened, and thickened, at times materially diminishing the calibre of the tube. It is usually, but not always, covered with a thick, tenacious, or puriform mucus. In cases of some standing this mucus may become inspissated, so that the course of the bronchi is marked out by yellow lines. Fibrinous concretions are sometimes observed. The other coats of the bronchi are also thickened and swelled, so that their cut extremities stand out prominently from the pulmonary tissue to an extent which is more marked in the child than in the adult. The anterior branches are sometimes less affected than the posterior, particularly in diphtheria. The inflamed tubes tend to become dilated, owing to the loss of resistance of their wall, which is infiltrated with inflammatory products. In the larger tubes the dilations are commonly fusiform and cylindrical; in the smaller they are globular, and the terminal dilations may attain the size of a millet-seed or hemp-seed. They may stand out prominently on the pleural surface, and yield a yellow fluid when punctured, or they may, when distended by inspissated pus, strongly resemble tubercles. They may also rupture into the pleura and give rise to pneumothorax. In the more marked dilations the thickening of the walls disappears and they may be almost membranous. Dilation is more commonly marked in the broncho-pneumonia of whooping-cough.

The extension of the inflammatory

process to the lung is intimately associated with the process of collapse. The extent of collapse in infantile bronchitis is largely due to the obstruction of the bronchial secretion. It may occur both in lobular and disseminated and also in diffused form. In its early stages it is capable of insufflation, which distinguishes it in either form from lung-tissue filled with inflammatory products; but this capability for insufflation may be lost. It is generally distinguishable from pneumonic infiltration by being sunk below the level of the surrounding tissue, by its glistening smooth section, and by the fact that, when occurring at the surface of the lung, the pleura shows no sign of exudation and still maintains its transparency. Its areas are harder and resist pressure more than inflamed portions of the lung, and when scattered thickly throughout the organ may give to the finger the sensation of shot-grains. In these collapsed portions of lungs pneumonia tends to occur. Hyperæmia ensues, owing to the impeded circulation arising from defective respiratory movement; and this is followed by œdema. The collapsed portions become more bulky, of a deep-purple color, and softer than before. Under the name of "splenization" the condition has often been confounded with inflammation, as also has the condition which has preceded it, to which the name of "carnization" has been given. In neither of these states, however, has a true inflammatory exudation occurred. On pathological as well as clinical grounds it is important that the distinction should be maintained.

Inflammation is characterized by a greater solidity and increasing softness of the lung-tissue: characters which are unreliable except as questions of degree. The most important points of distinction are the loss of capability of insufflation,

the opacity of the tissue, and its duller-white color, which is frequently granular on scraping or section, or, if not granular, has a rougher appearance than the section of a simply collapsed part. If the inflammation has reached the surface, the implication of the pleura is a further distinction. The area of these spots varies, and sometimes the inflammatory change may be found scattered through a collapsed and congested part. They yield a milky juice on scraping or pressure, due to an epithelial proliferation in the interior of the alveoli, mingled with leucocytes which have probably escaped from the vessels. The amount of fibrinous exudation is, however, relatively small. Nodules of pneumonic change, probably proceeding by direct extension from the bronchi, may be found in the midst of collapsed portions without the intervention of congestion and œdema.

Lobular pneumonia thus frequently proceeds indirectly from lobular collapse. It arises also directly in the vesicular structure by extension from the bronchi. The nodules of vesicular pneumonia may vary in size from a pin's point to a hemp-seed, or they may be so small as only to be recognized by the microscope. At first the spots may have the dark-red color of the ordinary acute form, but they tend to pass rapidly into a dull-yellowish, opaque-white color, which has a finely-granular aspect. They are not markedly prominent, and they fade insensibly into the surrounding tissue, though when occurring in the midst of collapsed lung they stand out distinctly from the dull-purple ground on which they are situated. They are soft and easily broken down, and yield a milky juice on scraping or pressure. The nodules tend to become confluent, and may sometimes form racemose groups, but these are less distinct and less sharply defined than those

of tubercle. Their histological structure is identical with that of areas of lobular collapse, viz.: an epithelial proliferation mingled with leucocytes which fill the alveoli.

Balzer has described another process by which the lung is affected from the bronchi, viz.: by direct extension of the inflammation from the bronchial wall to the surrounding pulmonary tissue, which he regards as the most common form.

More diffused forms of pneumonic consolidation are found in some instances, and particularly in measles. It is probable that some of these arise from secondary inflammation of collapsed portions; others may arise from the confluence of lobules primarily affected, but it is possible also that a more diffuse inflammation may, in some cases, directly attack the lung without the intervention of either of these processes, and through the immediate effect of the poison of the primary disease.

The very varied proportions in which bronchial dilations and collapse and genuine pneumonic consolidation occur in different cases of capillary bronchitis—variations which are, in part, due to the diseases in which they severally originate—have led some authors to deny that a genuine pneumonia is present in these cases, and in some instances but little can be found post-mortem beyond the two first-named conditions. A genuine broncho-pneumonia does, however, occur.

The collapse which occurs in many exhausting diseases may lead to secondary pneumonia in the same manner as it does in the bronchitis of childhood. In many cases only congestion and splenization occur, but in others a true pneumonia presenting a striking resemblance to that of childhood is found.

Hæmorrhagic extravasations into the lung are not uncommon, and are mostly

subpleural and petechial, but may be more extensive.

Emphysema almost constantly accompanies broncho-pneumonia. It affects mainly the upper lobes, especially their anterior margins. This emphysema is sometimes termed "compensating," and is believed by some to originate in the lung's expanding to occupy the areas between the collapsed portions. It is, however, more probably due, in part, to cough and, in part, to inspiratory effort, resembling that found in acute asphyxial conditions. Interlobular emphysema is not uncommon in fatal cases of whooping-cough at early ages.

The disease almost invariably affects both lungs. The amount and character of the affection may vary greatly on different sides: on one, collapse or diffuse pneumonia may predominate; on the other, pneumonia may be lobular and the amount of collapse small.

In the further progress of broncho-pneumonia there is little doubt but that in many cases a perfect *restitutio ad integrum* may occur, and that the lung may regain its normal condition. In other instances, however, dilated bronchi may long persist, with some condensation of the pulmonary tissue surrounding them, but may gradually return to the normal state, so far as may be judged of from the physical signs. Abscesses occasionally form, though usually they are small in size, and gangrene is sometimes observed in the affected portions. In rarer instances general consolidation of the lung may remain in a chronic form. In some instances the pneumonic nodules, particularly in scrofulous and rickety children, may pass into cheesy changes, with destruction of tissue, and may run the subsequent course of tubercle. In some instances the process is tuberculous from the beginning.

The associated pathology of broncho-pneumonia presents but few special features apart from those of the diseases which it complicates. The pleura is almost invariably inflamed when the pneumonia reaches the surface, but effusion to any extent is not common. It is not, however, affected over collapsed portions, and, when these are superficial, the state of the pleura may aid in the diagnosis between collapse and pneumonia. The bronchial glands are swelled and medullary-looking. Sometimes they are distinctly hyperæmic, but, when the swelling is extreme, they may be pale. In a few cases they are unaffected. Sometimes cheesy spots or calcified nodules are found in them, but these usually accompany tubercles in the lung.

The dilatation of the right side of the heart, resulting from obstruction to the pulmonary circulation, may lead to persistence of the openings of the foramen ovale and ductus arteriosus. Thrombosis of the pulmonary artery is occasionally observed. Pericarditis is also an occasional complication.

The appearances observed in other organs are, for the most part, the result of venous congestion. Œdema and congestion of the brain are common in fatal cases. Meningitis of the base is a rare complication. The liver is congested, and hyperæmia and catarrh of the stomach and intestines are also common. In the large intestines the catarrhal congestion may even give rise to dysenteric changes. The kidneys are also congested, and concretions of urates are often found in the straight tubules of the pyramids. General dropsy is an occasional complication.

Treatment.—While to some extent dependent upon the exciting cause of the pathological process in the individual case, and subject to modification accord-

ing to age, sex, personal characteristics, environment, and so forth, the general lines of treatment in cases of broncho-pneumonia are very much alike in all cases.

In the acute form of the disease rest is necessary, and, if the process be severe, rest in bed. Sufficient ventilation without exposure of the patient to draft is a necessity; and, in general, the temperature of the sick-room should be kept as near 70° F. as possible. When the patient is aged, or in the case of capillary bronchitis in children, a higher temperature, even to 80° F. is sometimes necessary. In capillary bronchitis, too, the air of the room should be kept moist by the evaporation of water, on which aromatic or terebinthinate substances (eucalyptol, menthol, etc.) may be thrown so that their vapors may be pleasantly and equally diffused.

Literature of '96-'97-'98.

The plan in the treatment of cases of broncho-pneumonia is to put children in a room warmed to 75° F. or above, to keep a kettle of water boiling in the room, and on the kettle to keep a vessel of beech-wood creasote or pine-needle oil, care being taken that the creasote does not boil down and become too pungent. One seldom needs cough-syrups or expectorants in such an environment. George M. Swift (*Archives of Ped.*, Apr., '96).

Antiseptic steam inhalations objected to. They are a source of a great deal of harm, for they do not reach the seat of the disease and disinfect the local process, while they keep the air of the room surcharged with moisture and usually at a high temperature. If a well person should stay in a room twenty-four hours where there was a boiling kettle saturating the air with carbolic acid, compound tincture of benzoin, or some such substances as were so commonly used, he would begin to realize how enormously debilitating it is. Oxygen

is useful. Herman W. Biggs (*Med. Rec.*, Mar. 16, '96).

Hot flaxseed poultices applied over the affected area, or, when the process is wide-spread, over the entire chest, front and back (jacket poultice), are of great service. The poultice should be well made by slowly stirring boiling water into successive portions of flaxseedmeal, and the mixture should then be spread between two layers of cheese-cloth. Oiled silk should be applied over the poultice, and the whole kept in place neatly by pins or bandage. Well made, properly applied, the poultice should retain its heat from four to six hours. From two to three poultices are to be applied during the day, and "at bed-time" the skin is to be well dried and sponged with alcohol and alum, and the chest is enveloped in a jacket of lambs' wool. The following day and the third day, if necessary, the poultices are reapplied, the lambs' wool being again substituted at night. It is rarely advisable to continue poulticing longer than this. In some cases poulticing may be preceded by counter-irritation. The best method of counter-irritation is by means of a mild mustard plaster, made with the addition of glycerin and white of egg. This can be retained in position for an hour or two without bad effect. In children it is better to rub the chest with amber-oil night and morning. Sometimes the lambs' wool or cotton jacket may be applied immediately, or following upon the counter-irritation without the use of poultices. Considerable pain in the chest, wide-spread, or massive, consolidation or blocking of the air-vesicles constitute the indication for the use of poultices. In tuberculous cases, and when for any reason poulticing cannot be properly carried out, dry heat by means of hot-water bag, salt bag, etc., or

moist heat by hot compresses may be substituted. The application of ice to the chest is strongly urged by some writers, and Mays has recently undertaken a collective investigation, cases of both croupous and catarrhal pneumonia being included in his reports, which are exceedingly favorable. I do not employ the ice-pack in broncho-pneumonia; but in tuberculous cases when the temperature exceeds 100° an ice-bag over the heart should be applied.

Ice treatment recommended in all kinds of broncho-pneumonia in children of all ages. The smaller the child, the more pronounced the effect. In these, ice-bags are placed on the head; in severe cases on the chest also; or a Leiter coil is used. Stimulants may be used in combination. A high rectal temperature is the guide. Angel Money (*Lancet*, '91).

Literature of '96-'97-'98-'99.

If there is any advantage in a poultice, which is very much doubted, it is greatly unbalanced by the dangers of an everchanging temperature in the region of the chest as must follow a succession of poultices. F. G. Haworth (*Lancet*, May 9, '96).

The topical use of compresses made from three thicknesses of old crash or linen, moistened with water at a temperature of 60° F. and firmly bound to the chest with a flannel bandage, lauded. The application is renewed every hour so long as the temperature ranges between 100° and 101° F., and every half-hour if the temperature be higher. Baruch (*Phila. Polyclinic*, vol. v, p. 76, '96).

In acute broncho-pneumonia in children hydrotherapeutic treatment may be applied by various means. The cold chest-pack should be applied every quarter of an hour at first, and then at longer intervals as satisfactory effects are obtained. If these fail after a few applications, the wet pack is to be tried; and in event of its failure recourse must be had to tepid or cold bath. In per-

sonal practice the bath is begun with a temperature $3\frac{3}{8}^{\circ}$ below that of the child. This first bath is very short (five minutes). An hour later a bath at 95° F. is given for ten minutes; and two hours later another at 90° for fifteen minutes. The following baths at three-hour intervals are given at 86° or even at 77° when the pyrexia yields but temporarily. An important duty lies in frequent washing of the mouth, throat, and nasal fossæ with boric-acid solution and Vichy water. The broncho-pneumonia of children is better treated by hydrotherapy, alcohol, hypodermic injections of caffeine, and careful hygienic precautions than by any of the older methods of treatment. Legendre (*Le Semaine Méd.*, Mar. 4, '96).

In the Babies' Hospital, New York, the broncho-pneumonic patients are kept in a ward by themselves with never less than 1000 and usually 1200 cubic feet of air allowed to each bed. The temperature of the ward is kept as nearly as possible at 70° F. and, in addition to as good ventilation as possible, the children are removed from the ward at least once a day to allow a thorough airing. Great attention is given to the feeding of these infants. The food is always considerably diluted, although the regular hours of feeding are maintained. Water is given freely between feedings, usually combined with stimulants. For the youngest infants, partly-peptonized milk is the chief reliance. Close attention is given to the bowels, particularly to avoid distension of the colon with gas. Wherever there is a disposition to much fermentation in the colon, the bowel is emptied once a day by irrigation. The general plan of treatment is to use as few drugs as possible, reserving the stomach for food and stimulants, and relying upon external measures or applications to control special symptoms.

Counter-irritation is made with paste of 1 part of mustard and 6 parts of flour, which is made to encircle the chest. It is left on only long enough to redden the skin—i.e., five or six minutes—and the application is repeated from three to eight times a day. Inhalations are used systematically in all cases, usually every

three or four hours. The child is placed in a closed tent into which steam is introduced from a croup-kettle. L. Emmett Holt (*Archives of Pediatrics*, Apr., '96).

In the Children's Hospital, Washington, D. C., most cases of broncho-pneumonia are so slight as to call for little more than rest in bed, a liquid diet, and the cotton jacket. If the inflammation extends to considerable areas, more active measures are pursued. Counter-irritation is produced by mustard pastes, turpentine stupes, or camphorated oil applied to the chest, but never to the extent of blistering. Hot flaxseedmeal poultices are indicated when the pulmonary congestion is intense or general. Samuel S. Adams (*Archives of Pediatrics*, Apr., '96).

In the New York Foundling Hospital in broncho-pneumonia of moderate extent and not following measles, whooping-cough, diphtheria, or influenza, treatment is mostly symptomatic. For pain, localized, intermittent poulticing is employed. Poultice is made of English mustard mixed with cold water, 1 part, stirred into boiled flaxseed, 3 or 4 parts. The poultice is made up thin and large enough to cover the whole back of the thorax or the whole front or the whole of either side, as may be desired. This is kept on till the skin is well reddened. The poultice is then slipped out and a hot dry flannel is slipped under the clothes (or padded vest) to replace it. High temperature, not so much reliance being placed upon the thermometer as upon the symptoms, is to be relieved by baths. Sponging with warm water and alcohol, followed by fanning, cools the skin well. Immersion in water at 90° for from seven to fifteen minutes, with constant rubbing, is also employed. In all cases attention is paid to keeping the feet warm. W. P. Northrup (*Archives of Ped.*, Apr., '96).

In broncho-pneumonia applications of cold water to the affected side with cold applications to the head recommended, and, in the event of the temperature's going above 103°, cold plunges as best method of treatment. M. S. Marey (*Archives of Pediatrics*, Feb., '99).

Sponging the entire body twice daily with tepid water and aromatics or alcohol adds greatly to the comfort of the patient. Should the temperature be high, cool sponging, the cold pack, or the bath may be used. There must not, however, be any sudden shock in the latter case. The child should be plunged in water at 95° F., gradually reduced to 80° during the first bath. Friction should be used and the duration of the bath be from eight to ten minutes. Subsequent baths with successively lower initial temperatures not falling below 80°, and final temperatures not falling below 70°, may be given at intervals of about four hours, whenever the temperature exceeds 104° F. The effect upon general comfort as well as upon temperature must be considered. In cases of meningitis or with severe cerebral symptoms, an ice-cap should be applied to the head.

Cold baths are most useful in those cases of broncho-pneumonia in which the general symptoms are marked and several symptoms predominate. Chemical antithermics produce untoward effects, but may be used moderately in conjunction with the bath. When families oppose the bath, a little artifice may be employed, such as adding a little mustard to the water under the guise of a revulsive. The bath is contra-indicated when the local lesion is extensive, but useful even then, if temperature is high. It is contra-indicated, also, when the heart is disturbed or when the adynamia is marked. The child is put into a tub containing water at 92° F. for a period ranging from five to ten minutes, being taken out before it becomes chilled. The temperature of the water is lowered with each bath until it reaches 75° F. Friction should be practiced and the head soused with cold water. Patient is put in woolen sheets, dried, and fed. If in three hours the temperature is still above 102° F., the bath must be repeated until dyspnea and excitement have abated. Quinine is given to sustain the

heart; also an hypodermic of caffeine, and ether in collapse. Milk and water and broth are insisted upon, to increase the urine; also grog and cognac, of which a child one year old may take as high as 2 ounces a day. The cold bath is of service in the broncho-pneumonia of measles and whooping-cough. Hutinel (*Le Bull. Méd.*, '92).

In broncho-pneumonia water-baths or Priessnitz's wet cloths used to avoid asphyxia, cyanosis, and carbon-dioxide poisoning. To avoid venous stasis the position of the patient is changed every hour, and he is not allowed to remain long on his back. He is also made to take four or five deep inspirations every half-hour. Nothnagel (*Med. Press and Circ.*, Jan. 9, '95).

Literature of '96-'97-'98.

As soon as a child has subreptant rales with slight fever, it should be systematically submitted to treatment by hot mustard baths as the best possible means of forestalling an aggravation of the disease. Lemoine (*Nord Méd.*, Dec. 15, '97).

Ice may be applied over the heart, as already stated, whenever the temperature shows a tendency to exceed 100° F. The application should be continuous until the temperature declines, and should be repeated according to necessity. Should this fail to bring the temperature to or below 100° F., nitrogen monoxide, about 8 gallons daily, should be given by inhalation. As the rise in temperature is usually postmeridian, the inhalation should be given in the forenoon, four gallons being administered at about 9 o'clock and four at about 11 o'clock. This will also conduce to sleep at night.

Food should be given as in fevers generally, in small quantities, at intervals of two or three hours, and should consist of easily-assimilable and concentrated nutriment, pancreatized milk, beef-juice, egg-albumin, soft-boiled eggs, and the like. Children, the aged, and tubercu-

lous patients are usually benefited by alcohol in small quantities, given with the food. The patient should be encouraged to drink sufficient water to keep up to normal the quantity of urine excreted, and it is usually well to give a mild alkaline diuretic, as solution of potassium citrate or solution of ammonium acetate.

If there is any tendency to constipation, or any failure of daily action of the bowel, calomel, alkaline laxatives, glycerin suppositories, or enemata should be employed according to circumstances. It is usually well to begin treatment with the administration of calomel in divided doses.

General medication is useful. At the outset in the aged and in feeble children strychnine should be given in doses of about $\frac{1}{140}$ grain to $\frac{1}{250}$ grain, repeated at intervals of from one to six hours, according to age and effect. It is not well to make a profound impression with the drug, or the patient's recuperative force will be exhausted. A gentle and continuous support to the vital powers is the object aimed at. For emergencies strychnine may be given hypodermically in doses to suit the occasion. Should cardiac debility become alarming, strychnine should be supplemented by camphor, which in children usually acts efficiently when given as spirit of camphor by the mouth, in appropriate dosage: from 1 to 10 drops; to an infant, $\frac{1}{4}$ drop in hot water. To an adult, camphor should be given hypodermically, dissolved in sterilized olive-oil, 1 to 10; one, two, or three syringefuls of 20 to 30 minims each may be given, as needed. Hypodermic injections of ether are sometimes useful. To children alternate hot and cold douches may be applied. The ammonium preparations are useful in nearly all cases. The aromatic spirit of ammonia, ammonium carbonate, ammonium

chloride, or ammonium salicylate may be chosen. A good formula for an adult consists of:—

- ℞ Ammonium chloride, 10 grains.
 Ammonium carbonate, 5 grains.
 Fluid extract of coca, 1 fluidrachm.
 Spirit of nitrous ether, 20 minims.
 "Essence of pepsin," 1 fluidrachm.
 Water, or
 Solution of ammonium acetate, sufficient to make $\frac{1}{2}$ fluidounce.

Dose: Tablespoonful ($\frac{1}{2}$ fluidounce) every two, three, or four hours.

The coca in this formula, while it is useful as a heart- tonic and diuretic, is used primarily merely to disguise the ammonium taste, and the pepsin preparation helps the stomach to bear the medicine. If pleurisy exists, ammonium salicylate may be added to this mixture. Another useful method of giving ammonium carbonate is to dissolve 5 or 10 grains in a dessertspoonful of liquor ammonii acetatis, and put this dose with 15 drops of glycerin and a drachm or two of sherry-wine in a wineglassful of cracked ice. The whole can be swallowed at a gulp, and will often be retained without disturbance of the stomach, when the drug cannot otherwise be given.

Opium need not be given except there be urgent indication to relieve pain or quiet excessive unproductive cough. It should then be used with circumspection. Codeine is usually the best preparation, but, if preferred, the deodorized tincture of opium or the camphorated tincture of opium may be added to the aromatic spirit of ammonia or other ammonium preparation employed. With children, paregoric is usually the best form in which to give opium.

In cases of continued weakness of the heart, not sufficiently urgent to call for

the hypodermic use of camphor, tincture of digitalis or Merck's German digitalin may be used in such doses as will produce the effect desired. In tuberculous cases, especially those with high fever, digitalis may be employed in fairly large doses, as urged by Beddoes, and this use of it sometimes seems to be followed by the happiest results. From 20 to 30 drops of a good tincture may be given to an adult from three to six times a day, until the pulse is reduced to 60 beats per minute; after which sufficient is given, the stomach permitting, to keep the pulse-rate in the neighborhood of 70.

Literature of '96-'97-'98-'99.

Out of 150 cases of broncho-pneumonia treated by rectal injections of creasote, 125 recovered and only 25 died. If the enemata should not be retained, a few drops of laudanum may be added. The simplest and most practical means of administering the creasote is in milk; the amount of creasote for a child under a year is from 2 to 5 drops night and morning; for an adult, from 30 to 40 and even 50 drops in each enema. The quantity of milk should not exceed an ordinary glassful. The enema should be given warm; if it is evacuated immediately or within a short time, it is necessary to give a second one. If no movement has been produced for a day, the intestine should be emptied with an enema of warm water and glycerin. Schoull (*Jour. des Prat.*, June 12, '97).

Large doses of belladonna valuable in broncho-pneumonia in children. Out of about sixty cases treated by this plan only two deaths occurred. In addition to the large dose the extract of the late British Pharmacopœia is especially recommended. This is given in $\frac{1}{4}$ -grain doses, every three or four hours, irrespective of the age of the infant. In a very few cases these doses induce light delirium, which is quickly relieved by lessening the dose. In a large majority there is some flushing of the skin, in some a definite scarlet rash. The chil-

dren under this treatment are irritable. J. A. Coutts (Brit. Med. Jour., Jan. 28, '99).

In children, and especially if the symptoms be those of suffocative catarrh, it is well to cause occasional emesis, for which purpose syrup of ipecacuanha, alum in syrup of ipecacuanha or in honey, or, if these fail, apomorphine may be employed. Turpeth mineral has been commended, but I have never used it. Following the emesis there is sometimes much prostration. I have found the inhalation of amyl-nitrite, cautiously administered, of great service at this time; and also when suffocation cannot be relieved by emesis. In such cases, too, some more active expectorant than the ammonium preparations may be continuously necessary; and syrup of senega, squill, or ipecacuanha may be used. In mild cases, a useful mixture is made with 10 minims, each, of syrup of ipecacuanha, aromatic spirit of ammonia, and paregoric, in water, which may be given every second or third hour.

In the broncho-pneumonia of influenza in children the use of emetics is condemned, as being a powerful factor in the production of pulmonary collapse and in the increase of the general prostration. Indication is to use stimulating expectorants early, and to reanimate the innervating powers by means of alcohol, caffeine, and injections of camphorated oil. This treatment must be pursued energetically from the very onset of the attack. Clemente Ferreira (*Revue Men. des Mal. de l'Enfance*, Mar., '95).

In influenza sodium benzoate and cinchonidine salicylate are useful, and are to be combined with or substituted for other drugs mentioned.

In tuberculosis, the guaiacol salts, carbonate and salicylate, are to be employed; or, if the stomach will bear it, creasote may be given. Creasote carbonate may

often be given in large doses when creasote cannot be taken.

As recovery takes place, the medication, whatever it may have been, should be gradually withdrawn. Should resolution be sluggish, it is well to give ammonium iodide, preferably in a vehicle containing pepsin, and followed by a large draught of water. The dose should be small at first, 5 grains for an adult, and gradually increased. The application of hot poultices for a few days is again likely to be useful.

When recovery is unduly delayed the application over the affected areas of mercurial ointment, or of iodine in lanolin (20 grains to the ounce) well rubbed in, often seems to hasten it. Calomel in small, frequently repeated doses for two or three days, just avoiding salivation, is not rarely useful at this time.

Should there be suppression of urine, bloody urine, or albuminuria, it is well to suspend all medication except some bland alkaline diuretic, and take blood, either from the arm, or by wet cups over the kidneys, after which warm (100° F.) physiological saline solution should be introduced either by a vein or under the skin. High irrigation of the colon with hot physiological saline solution (110° F.) may temporarily substitute the venous or subcutaneous infusion. When the condition of the patient is markedly septic or toxæmic, as shown by muttering delirium and general depression, the same measures should be used.

Leeching back of the ears may be the best method of depletion in cerebral cases. When the chief difficulty seems to be in the circulation, judgment must be exercised, in view of all the circumstances of the case, as to the employment of these measures. If one can be sure that the obstacle to circulation is not merely the weakness of the heart, but

that the latter is simply an indication of peripheral difficulty, blood-letting by wet cupping over the chest or even by venesection is justifiable; and the introduction of saline solution may usefully follow. Sometimes the use of nitroglycerin internally suffices.

When the respiratory obstruction seems to be great, as shown by cyanosis, dyspnoea, rapidity of breathing, short, hacking, incessant, unproductive cough, there is no measure so useful as the inhalation of oxygen. At first this must be as nearly continuous as possible. As improvement takes place, the intervals and duration of inhalations are modified accordingly. It is especially in children, in the aged, in cases following the exanthemata, and in septic cases generally that I have seen oxygen save life. Convalescence must be skillfully managed to avoid the development of chronic broncho-pneumonia, or the supervention of tuberculosis in non-tuberculous cases. Food, fresh air, cold-water bathing, and friction of the skin, with perhaps, in some cases, roborant medication by means of iron, arsenic, hypophosphites, and the like, and regulated pulmonary gymnastics meet the indications.

Chronic broncho-pneumonia calls for good general hygiene and nutrition, the application of fly-blisters over the chest, and systematic expansion of the chest by inhalation of compressed air or other efficient means. Internally iodine compounds are to be given. Pills of iodoform; or of iodoform and iron; or of iodoform, iron, and arsenic may be alternated with ammonium iodide or syrup of hydriodic acid. Small doses are to be given at first, and gradually increased to the point of tolerance. If the cases prove rebellious to this line of management, a sea-voyage should be recommended, and, this failing, change of residence, tem-

porary or permanent; to an altitude in the case of one young and robust; to a warm, but equable, region in the case of the aged.

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PNEUMONIA, CHRONIC INTERSTITIAL. See TUBERCULOSIS.

PNEUMONIA, LOBAR.

Synonyms. — Croupous pneumonia; fibrinous pneumonia; pneumonitis; lung-fever.

Definition. — Pneumonia is an acute infectious disease with a characteristic pulmonary lesion, due to the outpouring, into an extensive portion of the alveolar structure of the lung, of an hæmorrhagic fibrinous exudate.

Symptoms. — The symptoms of acute pneumonia are dependent both upon the local and upon the general infection. The former, however, usually, though not always, predominate. The onset is usually sudden, with a pronounced chill, which is frequently severe and prolonged. Ordinarily it occurs abruptly without any previous warning, but in some instances it is preceded by a day or two of ill health.

In children the chill may be replaced by headache, nausea, marked vomiting, delirium, or convulsions. Less frequently the onset of the disease is gradual, with a prodromal stage lasting from a few days to a week. These prodromes are indefinite, and may be such as accompany any infectious disease, or may be constituted by symptoms pointing to the lungs, such as cough, pain in the chest, or slight dyspnoea. These symptoms, however, may be due to a pre-existing bronchitis, which in itself may predispose to croupous pneumonia; even in these cases the onset of the pneumonia may be attended with a chill or some marked tho-

racie symptom. In other cases, however, pneumonia may supervene gradually upon a pre-existing bronchitis, the point of demarkation between the two not being evident.

The fever rises rapidly and lasts from five to seven days, exceptionally terminating earlier and frequently later. Its decline is usually by crisis, and is attended with great prostration; rapid improvement in the condition of the lungs ensues and convalescence quickly follows. Subjective symptoms occur early in the first day, and pain of a distressing character is frequently a prominent symptom. A dry, half-suppressed cough soon occurs, which aggravates the pain and much increases the patient's suffering. Pain is usually referred to the site of the lesion. Respirations are accelerated and somewhat irregular and shallow, being restricted by the pain caused by a deep inspiration. Later in the course of the disease the respiratory movements become very rapid and shallow, owing to the restriction of air-space due to the lesion. The dyspnœa is frequently so great that the auxiliary muscles of respiration are brought into use, while the nasal alæ are distended with each respiratory movement; the face is cyanosed, the cheek upon the affected side is often especially flushed, and the conjunctivæ are suffused. There is usually an expression of great anxiety.

The expectoration upon the second day of the disease becomes characteristic. It is viscid, airless, extremely tenacious, and possesses a peculiar rusty discoloration. Upon the second or third day the eruption of an abundant crop of herpes about the lips and alæ of the nose is to be observed: a symptom often of great diagnostic value in obscure cases. Nervous symptoms present themselves early and in severe cases are never absent. Head-

ache, sleeplessness, and delirium are common manifestations of the disease. Nausea and vomiting, especially at the onset, are of not infrequent occurrence. Diarrhœa occasionally occurs, but constipation is the rule.

The course of the disease varies greatly, being influenced by the age of the patient, his habits and previous condition, as well as by the virulence of the infection. This accounts for the variation in type resulting in the different forms of croupous pneumonia about to be described. These variations are also to be ascribed to differences in the pathological anatomy, and in the character of bacterial infection. As a rule, cases of frank croupous pneumonia are due to infection by the pneumococcus, while the asthenic varieties of the disease are associated with other forms of bacteria, such as the bacillus typhosus, the bacillus of Pfeiffer, or with staphylococcic or streptococcic infection. In sthenic cases fever is invariably present and active, and in uncomplicated cases conforms more or less closely to a distinct type. The pulse is full and bounding and in frequency corresponds to the intensity of the fever.

Literature of '96-'97-'98.

Statistics of 150 cases of croupous pneumonia. Of these, 80 per cent. presented the characteristic chill, fever, and other symptoms, the disease lasting from 6 to 11 days. The right lung was involved in 60 per cent., the left in 24 per cent., of the cases; both lungs in 16 per cent. In 12 the apex was involved, but in these no cerebral symptoms were present. The initial chill was absent in 14 per cent. of cases occurring in adults. In three cases in old subjects the temperature remained low, never rising above 100.1°. In 3 cases sudden death occurred, probably due to the action of the toxins upon the heart. Leucocytosis was found in 22 of 30 cases, a marked increase occurring immediately before

the crisis; in the cases examined within thirty-six hours after the crisis there was no further evidence of leucocytosis. Elsner (*Med. News*, Jan. 8, '98).

SPECIAL SYMPTOMS.—Pain is a symptom of great frequency, and is always present when the lesion extends to the periphery of the lung. It is sharp, stabbing, agonizing in character, and is usually referred to the region of the nipple of the affected side. Its possible reflection to other points, however, such as the abdomen or beneath the shoulder-blade, must not be overlooked. It is probably due to the pleurisy associated with peripheral lesions, and for this reason is commonly absent in central and deeply-seated pneumonias. It is aggravated when the patient coughs and upon deep inspiration. Pain occurred as a prominent symptom in 191 of 285 cases at the Philadelphia Hospital.

Dyspnœa is a prominent feature. In the early part of the disease it is due to the intense pain that attends deep inspiration; so that as a result each respiratory movement is partly suppressed. Later in the course of the disease, when pain usually ceases to be a marked feature, dyspnœa is to be ascribed to the limitation of air-space due to the pulmonary lesion. Respirations may be increased to forty or sixty, or even higher in the minute. As before stated, the inspirations are extremely shallow, while expiration is accomplished by a grunt. This expiratory grunt was noted in 79 of the Philadelphia-Hospital cases alluded to. Cough is a symptom of great constancy; its presence was noted in 201 of the same series. It is attended with great pain, and is therefore short and half-suppressed. Early in the disease it is hard and unproductive and is probably caused by the lesion and the associated bronchitis. Exceptionally it is slight or even absent alto-

gether when the lesion is limited or latent, as in the aged and in alcoholics, or when the disease develops in those enfeebled by some pre-existing disease. The sputum is characteristic and of diagnostic value. It is viscid and tenacious, so that it adheres to the vessel into which it is expectorated. It is stained with blood and possesses a reddish or yellowish-red color, giving to it the characteristics known as "rusty."

As the disease develops this rusty discoloration becomes more marked, and in some cases the expectoration consists of pure blood. In the later periods of the disease the sputum becomes more fluid and loses its tenacious, hæmorrhagic character. In the aged and alcoholics the sputum may possess the characteristics known as "prune-juice," being thin and abundant and dark brown in color. In some instances it is greenish in color: a condition demonstrated by von Jaksch to be due to the transformation of hæmoglobin into bilirubin. Prune-juice expectoration occurred in 5 of the cases of the Philadelphia-Hospital series. Expectoration may be absent altogether, especially in children and in the aged. It is not infrequently absent in drunkards. In 37 cases of the Philadelphia-Hospital series its absence was noted. Microscopically the sputum contains numerous red blood-corpuscles variously changed, but the corpuscular elements of the blood may be absent, the discoloration of the sputum under these circumstances being due to the solution of its coloring matter. Leucocytes and swelled, degenerated alveolar epithelium are present. It may also contain fibrinous casts of the smaller bronchial tubes and alveoli. Various bacteria are found upon staining: the pneumococcus, as well as other micro-organisms.

The frequency of the pulse corre-

sponds, as a rule, to the intensity of the fever. Early in the disease it is full, bounding, and tense, and in frequency ranges from 100 to 120. Later, when hepatization is extensive, it becomes feeble, small, and irregular, and occasionally becomes dicrotic. Collapse from heart-failure may occur during the later periods of the disease, when an extensive area of the lung is involved and is especially to be apprehended at the period of the crisis.

Leucocytosis is a marked feature of the disease, but does not invariably occur. The leucocytes are increased from the earliest periods of the disease and this increase persists during the continuance of the fever. At the time of the crisis the increase in the white cells disappears, the decrease frequently beginning a few hours before its actual occurrence. When defervescence is by lysis, the decline of leucocytosis is more gradual. The number of white cells may vary from the normal to 35,000 or more, as in the case reported by Cabot, in which the count was 94,600. The absence of leucocytosis indicates a very unfavorable prognosis in all but the mildest cases. All the instances in the Philadelphia-Hospital series in which leucocytosis did not occur terminated fatally. Its occurrence, however, is to be regarded as neither a good nor bad sign. In one instance at the Philadelphia Hospital, in which the white-cell count was 37,000, death occurred. The red blood-cells show a slight decrease. This is pointed out by Cabot as being partly due to blood-destruction, as is evidenced by the presence of "hydrobilirubin in the urine and the not infrequent occurrence of jaundice."

Anorexia, nausea, and vomiting are not uncommon, and jaundice is of not infrequent occurrence. This, when slight, possesses no prognostic significance, but

deep jaundice occurring in the course of the disease is usually an evidence of serious constitutional infection, and occurs only in the severe cases. To these cases the term bilious pneumonia has been applied, and the jaundice is usually associated with vomiting, diarrhœa, tympanites, marked nervous symptoms, and sometimes slight hepatic enlargement. In most cases of pneumonia, as in all acute infectious diseases, the spleen is enlarged. The kidneys are to some extent involved and occasionally an acute nephritis develops. Febrile albuminuria is present in many cases, and occurred in 45 cases of the Philadelphia-Hospital series. There is marked diminution of the chlorides, which is probably due partly to the amount accumulated in the exudate and partly to the diminished intake, the result of the loss of appetite; reappearance of the chlorides takes place during the stage of resolution. Otherwise the urine possesses the ordinary characteristics of febrile urine,—scanty, high colored, and acid in reaction. At the time of crisis it may be markedly increased and shows upon standing a heavy deposit of urates. In cases attended with jaundice the urine presents the evidences of the coloring matter of the bile.

Herpes is of such common occurrence in pneumonia as to possess diagnostic importance. The appearance of this eruption is especially valuable in cases of central pneumonia and in those instances in which the limitation of the lesion may render the diagnosis doubtful. It occurs early in the disease and is usually distributed about the lips and nasal alæ.

The nervous system is frequently disturbed. In mild cases mental dullness, headache, and marked prostration occur. In the severer forms of the disease delirium may be most marked. In most cases these nervous symptoms are due to the

infection and not to any pathological changes in the cerebral meninges. In other instances, however, inflammation of the meninges, as demonstrated at the autopsy, accounts for their occurrence. During life the differentiation between the two classes of cases is attended with much difficulty. Hyperpyrexia is usually associated with those cases in which marked cerebral perturbation occurs. In drunkards an attack of delirium tremens is very apt to characterize the onset of the disease, and as the symptoms of pneumonia may be absent systematic examination of the lungs in such cases is important. In children convulsions may occur at the onset of the disease and may then replace the chill.

Literature of '96-'97-'98.

Nervous symptoms are perhaps more frequent in pneumonia than in typhoid fever. From the onset the nervous features may so dominate the scene that the local lesion is likely to be overlooked. These cases may be grouped under three headings: 1. The cerebral pneumonia of children, in which the disease sets in with a convulsion; there is high fever, headache, delirium, great irritability, muscular tremor, and perhaps retraction of the head and neck. The diagnosis of meningitis is almost invariably made and the local affection may be overlooked. 2. Cases in which the disease sets in with acute mania. Pulmonary features are frequently masked in those of delirium tremens, and error is certain to occur, unless it is made an invariable rule to examine the chest in such cases. 3. Cases with toxic features, resembling those of uræmia. Without chill, cough, or pain in the side, the patient may develop fever, a little shortness of breath, and then gradually grow dull, heavy, and within three days there may be a condition of profound toxæmia, with low, muttering delirium. Osler (*Maryland Med. Jour.*, Mar. 12, '98).

Fever is almost always present and is

more or less typical. Its onset is abrupt, quickly following the chill, and its fastigium is rapidly attained. Its range is high, reaching 104° or 105° F. or higher, and is subcontinuous except when its course is interrupted by the distinct and marked remissions known as pseudocrises. These remissions are so decided as to lead to the hope that the actual crisis is about to take place; exacerbation of the fever follows, however, and the disease pursues its course, interrupted, perhaps, by one or more pseudocrises. The duration of the fever varies and in uncomplicated cases usually terminates in from five to nine days. It may, however, cease earlier, more frequently later. Defervescence is usually critical; occasionally, however, it is prolonged and may take place by lysis. In one of the series of cases at the Philadelphia Hospital convalescence did not begin until the nineteenth day, although no complication accounting for the sustained febrile temperature could be detected. Frequently there is a decided rise in the temperature immediately before the crisis; this is the so-called "precritical rise." In cases terminating fatally a so-called preagonistic rise in the temperature may occur, which at times reaches 108 degrees or higher. This preagonistic rise was noted in 9 of the Philadelphia-Hospital cases.

Physical Signs. — **INSPECTION.** — The patient usually lies upon the infected side: a decubitus very likely to be assumed in those instances in which pain is a common symptom. By assuming this attitude the respiratory excursions upon the affected side is limited and the rubbing together of the inflamed pleural surfaces reduced to a minimum. Evidences of dyspnoea are frequently to be observed and the degree of cyanosis and dilatation of the nasal alæ, with the play of the

auxiliary muscles of respiration, may constitute an important evidence of the extent to which the air-space is limited. In severe cases cyanosis of the cheeks and lips may be most marked. It is not uncommon for one cheek alone to show cyanosis, and this usually corresponds with the side of the lesion. No alteration in the contour of the chest is to be detected, but increased frequency of respiration is to be noted and limitation of the respiratory movement upon the affected side is often most marked. In the early stages of the disease this limitation is to be ascribed to the involuntary fixation of the chest-wall on account of the intense pleuritic pain. Later, when consolidation has supervened, this lack of expansion is due to inability to expand that portion of the lung. At the onset but little alteration in the vocal fremitus is to be detected. In proportion as consolidation develops, however, vocal fremitus is increased. Early in the disease a pleuritic fremitus is not uncommonly detected. Absence of vocal fremitus must not lead to a rash conclusion of the non-existence of pulmonary consolidation, or that the latter is associated with a pleural effusion, as the voice-vibrations are sometimes temporarily prevented from being transmitted to the lesion by the occlusion of a large bronchial tube with a mass of mucus.

PERCUSSION.—At the time of onset the percussion-note remains clear. As engorgement progresses, however, the note becomes higher in pitch and frequently possesses a tympanitic quality. With increase in the exudation and consequent driving out of the air from the air-vesicles and bronchioles a gradually-increasing degree of dullness supervenes. This dullness, however, even with the most massive consolidation, is never complete, for the reason that the involved area is

never totally lacking in air, which continues to pass in and out of the bronchial tubes ramifying throughout the involved area. Associated with dullness is a sensation of increased resistance to the finger. Over that portion of the lung immediately above the consolidated area percussion is apt to yield a note of tympanitic quality resembling the so-called Skodaic resonance. The unaffected portion of the lung and the lung upon the opposite side give hyperresonance upon percussion, owing to the increased function which the limitation of air-space makes necessary for these portions to perform.

The tympanitic resonance observed at the level of the area of hepatization, in cases of pneumonia of the apex, is not due to the acoustic qualities of the hepatized lung itself, nor to the vibration of the air in the bronchi of this part, it sometimes results from transmission of the sonorous vibration of the air contained in the large bronchi and the trachea; although most often it is the result of the vibration of air contained either in the subjacent lobes, relaxed by reason of the augmentation of volume of the hepatized lobe, or in the uninvolved relaxed parts of the hepatized lobe itself. Simon (*Revue de Méd.*, July 10, '94).

With the beginning of resolution and the consequent resorption of the exudate, dullness progressively diminishes as the air again enters the affected area. A return to the tympanitic quality of percussion-note takes place, however, before the resonance assumes its normal quality. Lesions of limited extent are not always susceptible of recognition by percussion. This is particularly the case in central pneumonia, in which the hepatized portion of the lung is surrounded by uninvolved structure.

AUSCULTATION in the early stage reveals diminished breath-sounds, and very shortly the crepitant râle is to be de-

ted, especially at the termination of a full inspiration. In addition to this significant rôle various râles, some coarse, some fine, moist as well as dry, are to be heard over both lungs; these sounds are evidences of the acute bronchial catarrh which so frequently accompanies pneumonia.

When solidification of the exudate occurs the crepitant rôle disappears and the breath-sounds become bronchial. Should the main bronchus leading to the consolidated area be obstructed with mucus, however, bronchial breathing as well as râles may be absent. Over the consolidated area the voice-sounds assume those peculiarities known as bronchophony. This may be modified to the extent that the voice-sounds possess the bleating and nasal qualities termed ægophony. During the stage of consolidation numerous bronchial râles, both dry and moist, are usually to be detected. As the exudation undergoes liquefaction with the occurrence of resolution numerous moist râles of marked intensity are to be heard. Bronchial breathing and bronchophony become less and less distinct; and the crepitant rôle, somewhat coarser in character than that which has accompanied the stage of congestion, is again to be heard: the crepitus redux. This, however, does not occur in all cases.

Over the unaffected portion of the involved lung, as well as over the unaffected lung, the breath-sounds remain vesicular, but intensified, constituting the so-called puerile breathing.

In central pneumonia bronchial breathing and the crepitant rôle may not be detected, for the reason that these sounds are muffled by the surrounding healthy lung.

SYMPTOMS OF ATYPICAL VARIETIES.

PNEUMONIA IN CHILDHOOD possesses characteristics that are somewhat peculiar.

The onset is frequently attended by convulsions or marked delirium in place of the chill so often characterizing the onset of the disease in adults. Gastro-intestinal disturbances, especially vomiting, occur with greater frequency in childhood. Pain is often absent or referred to other portions of the body, and the characteristic rusty sputum is of rare occurrence largely because of the infrequency of expectoration in early childhood. At this period of life, also, the physical signs of pneumonia are often masked, and the frequency with which the lesion occurs at the apex alone has been the source of many errors in diagnosis, its existence being overlooked. As in these cases decided nervous manifestations are usually marked, the necessity for great care in the physical examination of the pulmonary apices is emphasized.

In pneumonia in children a limited area of dullness is easily overlooked unless light percussion is employed, and even then, sometimes, there will be no dullness during the attack; sometimes the disease is diagnosed as existing on the wrong side, due to the affected lung's being obstructed as to air; while the unaffected lung performs the functions of both and is less resonant on percussion. Broncho-pneumonia may simulate croupous pneumonia very closely in all the local symptoms. The pain in pneumonia is sometimes referred by children to the abdomen. J. P. Crozer Griffith (*Med. Rec.*, May 25, '95).

In mobility croupous pneumonia in children fever occurs either with or without any prodromes, in about ten hours, or by slight prodromes lasting one or two days, in about three or four hours. The younger the child, the higher the fever. Pneumonia of the apex usually has a more severe fever than that of the lower lobes. Lysis is less common than in adults. During course of disease temperature and pulse are parallel. The exudate does not limit itself so strictly to the single lobe af-

fectured as it does in adults. Chill is much less frequent than in adults, and vomiting is much more common. Schlesinger (*Archiv f. Kinderh.*, vol. xxii, pts. 3-6).

PNEUMONIA OF THE AGED may begin suddenly, but more frequently the onset of the attack is gradual, the initial chill of the ordinary form of the disease being entirely wanting. Nervous symptoms are characteristic of this type of croupous pneumonia. Cough is usually absent and expectoration is slight or of the prune-juice variety. There is profound depression of vitality and the physical signs are usually ill defined. Pneumonia of the aged is an extremely grave affection.

ALCOHOLIC PNEUMONIA is frequently not manifested by early pulmonary symptoms; chest-pains and fever may be almost entirely wanting, cough may be slight, and the sputum may be abundant and thin, possessing the characteristics of prune-juice sputum; profuse sweating is often a marked manifestation. The fever is but of moderate degree, but marked nervous symptoms are common. The delirium may be of the low, muttering variety or may be wild and maniacal in character; indeed, the disease may be ushered in with all the manifestations of delirium tremens, while the subjective symptoms of pneumonia are entirely absent. This is an extremely grave form of the disease.

TYPHOID PNEUMONIA is a term used to designate both the asthenic forms of pneumonia and pneumonia as it occurs in the course of typhoid fever. In the former class of cases the disease receives this term from the low typhoid condition into which the patient lapses. In these cases nervous symptoms, of a depressed character, are prominent, and low, wandering delirium, ataxic nervous phenomena, intestinal disturbances, tympanites, a dry, coated tongue, and gradually

deepening stupor make up a clinical picture the grave significance of which can hardly be overlooked. Symptoms dependent upon the local lesion are frequently lacking and the diagnosis depends upon a systematic examination of the chest. The term typhoid is also frequently employed to designate pneumonia occurring in the course of typhoid fever as a complication, as well as to indicate those instances of so-called pneumotypus in which the pulmonary lesion depends upon the early localization of the typhoid bacillus within the pulmonary structure.

PNEUMONIA WITH CENTRAL LESIONS shows some modification of the usual symptomatology. While subjective symptoms may be marked, it will be readily understood that the physical signs are indefinite, so that the diagnosis depends mainly upon the former manifestations. Pain, however, is usually absent, as involvement of the pleura, upon which this symptom usually depends, does not occur. Apical pneumonia, or those cases in which the lesion begins at the apex, is often extremely grave and attended by marked nervous phenomena, particularly delirium. It is to this class of cases that the term cerebral pneumonia is sometimes applied.

Pneumonia occurs with great frequency as an intercurrent affection in a large group of chronic diseases, and is thus encountered during the course of chronic nephritis, diabetes, locomotor ataxia, and other chronic diseases of the nervous system. Under these circumstances it frequently constitutes the ultimate cause of death. In chronic pulmonary diseases, also,—as chronic tuberculosis and emphysema,—the disease at times occurs, and when associated with the latter affection is often of difficult diagnosis, owing to the indefinite char-

acter of the physical signs, due to the failure of the inflammatory exudate to completely fill the greatly distended air-vesicles, so that complete consolidation of the involved area does not take place.

Three forms of pneumonia have been described in accordance with the distribution of the local lesion: (1) migratory, or wandering, pneumonia, a form in which one lobe after the other is successively invaded; (2) double pneumonia, in which one or more lobes of both lungs are involved, but which otherwise shows no special modification of symptoms; and (3) crossed pneumonia, already referred to as that form in which the lower lobe of one side and the upper lobe of the other are involved.

Bilious pneumonia is that form in which marked jaundice is an associated symptom, and is probably due to a mixed infection.

Diagnosis.—The diagnosis of croupous pneumonia is usually unattended with difficulty. The sudden onset with chill, a temperature-curve corresponding to a more or less distinct type, the character of the sputum, the occurrence of herpes, the physical signs, and the sequence of events in general constitute a clinical picture in typical cases that admits of but little difficulty in diagnosis.

PLEURAL EFFUSIONS.—The differential diagnosis between croupous pneumonia and pleural effusion is sometimes difficult. This is particularly the case in those instances of pleural effusion in which bronchial breathing and bronchophony are decided physical phenomena. The onset of pleurisy, however, is not characterized by symptoms of the same intensity as attend the onset of croupous pneumonia. The chill is usually not severe: more frequently mere chilliness. The fever describes but a moderate curve: rarely above 102° F.

There is usually less cough and less abundant expectoration, and, of course, the rusty sputum is entirely absent. In pleural effusion the physical examination reveals alteration in the contour of the affected side of the chest, partial effacement of the intercostal spaces, restriction of the respiratory movements upon the affected side, and a possible visible displacement of the apex-beat of the heart; the vocal fremitus, also, is usually absent, while in croupous pneumonia it is increased. Percussion in pleural effusion usually yields a note that is dull or flat; in croupous pneumonia dullness is only partial. Of first importance in the differentiation of these two affections is the position of the adjacent viscera. In left-sided pleural effusion displacement of the heart to the right occurs, and depression of the fundus of the stomach results in the obliteration of the so-called semilunar space of Traube. In right-sided pleural effusion the heart is displaced to the left and the liver is displaced in the downward direction. In pneumonia the adjacent organs undergo no displacement. On auscultation the breath-sounds and voice-sounds in pleural effusion are usually diminished in intensity or possess a very distant bronchial character. In pneumonia bronchophony and bronchial breathing are very marked.

BRONCHO-PNEUMONIA.—Errors in diagnosis sometimes arise in the differentiation between croupous and broncho-pneumonia. The latter, however, lacks the well-developed signs that attend croupous pneumonia and is an affection that involves both lungs. Areas of dullness over which bronchial breathing and bronchophony occur are heard in patches here and there over both lungs. The onset is less abrupt and the evidences of pulmonary involvement are usually preceded by well-defined symptoms of bron-

chitis. There is an absence of rusty sputum; the disease is of longer duration and the termination is gradual and not attended by the well-marked crisis that so frequently characterizes the defervescence of croupous pneumonia.

PNEUMOTYPHUS.—The differential diagnosis between croupous pneumonia and the cases of so-called pneumotypus is often difficult and, indeed, may be impossible. It is only after repeated examinations and the final appearance of the characteristic symptoms of typhoid fever that the distinction can be made.

ATYPICAL FORMS OF PNEUMONIA.—The difficulties of diagnosis in cases of central pneumonia, in pneumonia as it occurs in emphysema, in alcoholic pneumonia, in pneumonia in the young and aged, and in pneumonia when it occurs as an intercurrent affection in other diseases have been already referred to. The knowledge of the deviation from the type which the disease assumes under these conditions should prove sufficient to keep one constantly on guard against a possible oversight of the existence of the lesion, for in many of these cases it is only by systematic and routine examination of the chest that the true condition of affairs can be arrived at.

ACUTE PNEUMONIC PHTHISIS.—To distinguish between croupous pneumonia and acute pneumonic phthisis is sometimes difficult. In the latter affection, however, the more gradual onset, the tendency of the fever to be remittent in type and attended with repeated chills, or chilliness; the profuse sweats; the rapid emaciation and abundant expectoration which, as the lung breaks down, shows the presence of tubercle bacilli; the location of the lesion, which is usually at the apex; and the absence of herpes, all serve to differentiate the con-

dition from croupous pneumonia. Of course, the diagnosis of the true nature of the affection becomes apparent when there supervenes upon the stage of consolidation the evidences of pulmonary breakdown.

NEUROSSES.—The frequent association of croupous pneumonia with marked nervous symptoms at times causes confusion between this disease and meningitis. The importance, therefore, of physical examination of the chest in all cases simulating meningitis cannot be too strongly insisted upon, and in this examination the pulmonary apices must not be overlooked.

Etiology.—In its geographical distribution pneumonia is a wide-spread affection. It prevails in all climates, and in this country is said to progressively increase as one passes from the arctic to the tropics. It occurs during all seasons of the year, but especially during the winter and early spring months. From the statistics of Aufrecht, Magdeberg-Alstadt, of 1501 cases, 544 occurred between January 1st and March 31st; 462 between April 1st and June 30th. In cold weather attended with changes of temperature the predisposition is greater than during prolonged cold.

Pneumonia may occur at any age, but may be considered to be of infrequent occurrence for the first five years of life, during which period the inflammatory conditions of the lung are more apt to appear in the form of broncho-pneumonia. It is of common occurrence between the twentieth and fortieth years of life, after which age there is a period of comparative lessened liability until the sixtieth year, when of all acute diseases pneumonia claims the largest number of deaths. An analysis of 285 cases admitted to the Philadelphia Hospital between January 1, 1897, and July 1, 1899,

divided into the various decades of life, gives the following results:—

1—10	10—20	20—30
4	10	44
30—40	40—50	50—60
55	43	46
60—70	70—80	over 80
54	26	2

Sex in itself offers neither immunity nor causes any special predisposition to croupous pneumonia. In early infancy and childhood, when the sexes are subject to the same environment, the liability to croupous pneumonia is equal. It is only when the active period of life is attained and the two sexes live under different conditions that there is a greater prevalence of pneumonia among the male than among the female sex. Again, when advanced age brings the two sexes once more under the influence of the same external conditions one shows but little liability over the other. Of the 285 cases at the Philadelphia Hospital 210 were males and 75 females; of course, the number of males admitted to the institution largely exceeds the number of females.

Occupation entails no special liability to the disease except as it may be attended by exposure to conditions which are in themselves predisposing. Pneumonia is of more frequent occurrence among the poor and those who live under bad hygienic surroundings than among the well-to-do. Depressed influences of all kinds, both mental and physical, may be considered as of predisposing importance. Thus, alcoholism, both acute and chronic, is a very important factor in the etiology of croupous pneumonia, both on account of its lowering effect upon the organism in general and on account of the exposure that is apt to

attend a debauch. It is these cases and those instances occurring in individuals the subjects of already existing disease which constitute, as a rule, the so-called asthenic forms of pneumonia, the sthenic types of the disease usually occurring in young and healthy robust adults. Convalescence from other acute illnesses must also be regarded as a predisposing factor. Individuals the subjects of malarial infection are supposed to possess a peculiar liability to the disease. That some people possess an individual predisposition to pneumonia must not be overlooked, and one attack of the disease, so far from creating an immunity, appears to predispose the individual to subsequent attacks. The importance played by cold as a cause of pneumonia was formerly much exaggerated. At one time regarded by many as the exciting cause of the disease, it is now considered but one of a number of predisposing influences. That this is the true relation of exposure to cold to the etiology of croupous pneumonia is warranted by the fact that in a considerable proportion of cases no history of such exposure can be traced.

The frequency with which the affection follows traumatism, especially of the chest, has been commented upon. Thus Litten (*Zeit. f. klin. Med.*, vol. xxvi, '82) in a collection of 320 cases of pneumonia found 4.4 per cent. due to injury. Of the cases at the Philadelphia Hospital already alluded to, but 2 gave a history of traumatism.

Literature of '96-'97-'98.

Injury alone cannot produce inflammation of the lungs, but acts by raising the virulence of the pneumococci already present, and by decreasing the resistance of the tissues. Pézerat (*Gaz. Hebdom. de Méd. et de Chir.*, No. 61, '98).

EXCITING CAUSE.—Pneumonia is an

infectious disease due to a number of micro-organisms, of which the most frequent is Fränkel's pneumococcus, or the diplococcus pneumoniae. That it is a general infection with a localization of the infecting principle in the lung, through which the specific toxin gains entrance to the general system, and not a local disease, is evidenced by the fact that there is no constant relation between the amount of tissue involved in the local lesion and the intensity of the symptoms. Thus, a limited pulmonary lesion may be attended by high fever and great general disturbance, while an extensive consolidation may be associated with mild pyrexia and slight constitutional disturbances. Further, the course of croupous pneumonia, as in all infectious diseases, conforms to a more or less distinct type, and the frequency with which the disease prevails in epidemic form is further proof of its infectious character.

The diplococcus pneumoniae first demonstrated by Fränkel and Weichselbaum to have pathogenic properties when inoculated, is frequently found under normal circumstances in the upper air-passages. It is not to be regarded as the exciting cause of croupous pneumonia alone, as in recent years its presence has been demonstrated in other diseases. Its existence has thus been discovered in many of the complications of croupous pneumonia, as in pleurisy, pericarditis, peritonitis, meningitis, ulcerative endocarditis, and nephritis; and in the absence of croupous pneumonia it is the exciting cause of a number of inflammatory processes, especially cerebro-spinal meningitis.

According to Netter (Compt.-rend. de la Soc. de Biol., No. 34, '87), the organism can be found in the saliva in 20 out of 100 normal individuals, and its pres-

ence has frequently been demonstrated in the nasal secretions. It is not, therefore, by inhalation that the diplococcus causes pneumonia; it must rather first enter the circulation and by means of the blood become colonized in the lungs. From this point further distribution by the circulation takes place and a general toxæmia results.

Literature of '96-'97-'98.

While recognizing that the discovery of the pneumococcus enables us to look upon croupous pneumonia as an infectious disease depending upon the action of this organism, the manner in which the micro-organism brings about the local and general condition remains unexplained. Although the pneumococcus may find its way into the blood- and lymph- vessels, the most likely channel of infection is by the air-passages. This view is sustained by the well-known fact that two-thirds of the cases of foreign bodies passing down the trachea find their way into the right bronchus, pneumonia being common on the right side. A. H. Smith (Med. Rec., Jan. 2, '97).

Frequency noted with which pneumonia follows ether anæsthesia. The infection probably takes place from the mouth to the lungs, through the air-passages. The exudation shows numerous micro-organisms, especially the pneumococcus. Whitney (Boston Med. and Surg. Jour., Sept. 23, '97).

Statistics collected of 12,842 etherizations, 30 of which were followed by pneumonia. Careless exposure to cold, etc., will not explain all cases. The theory that infection takes place from the mask or cone used is not supported by facts, as in hospitals, where a fresh sterilized towel was used, the percentage of pneumonia was not less than that where a fixed apparatus was employed. Some weight may be attributed to the fact that mucus from the nose and throat, being drawn into the trachea during narcosis, may predispose the patient to an attack of pneumonia. Anders (Univ. Med. Mag., Aug., '98).

Although Fränkel's diplococcus or, as

it is sometimes called from its frequent shape, the diplococcus lanceolatus, is the most frequent cause of croupous pneumonia, it must be borne in mind that the disease occurs as the result of infection with other forms of bacteria, and that the resulting pulmonary lesion is in no way to be differentiated anatomically from the changes produced by infection with Fränkel's organism. Friedländer's bacillus, streptococcic and staphylococcic infection, as well as the bacillus of Pfeiffer, are thus to be regarded as capable of producing croupous pneumonia. Similar changes have also recently been demonstrated to be due to infection with the bacillus typhosus of Eberth, so-called pneumotyphus, and, so far as the anatomical pulmonary changes are concerned, there are no points of differentiation from the changes produced by pneumococcic infection.

Literature of '96-'97-'98.

Series of experiments showing that the intratracheal injection of the pneumococcus, or other bacteria alone, was insufficient to cause the pneumonia, but that such resulted when irritating dust also was injected. Dürk (Deut. Archiv f. klin. Med., June, '97).

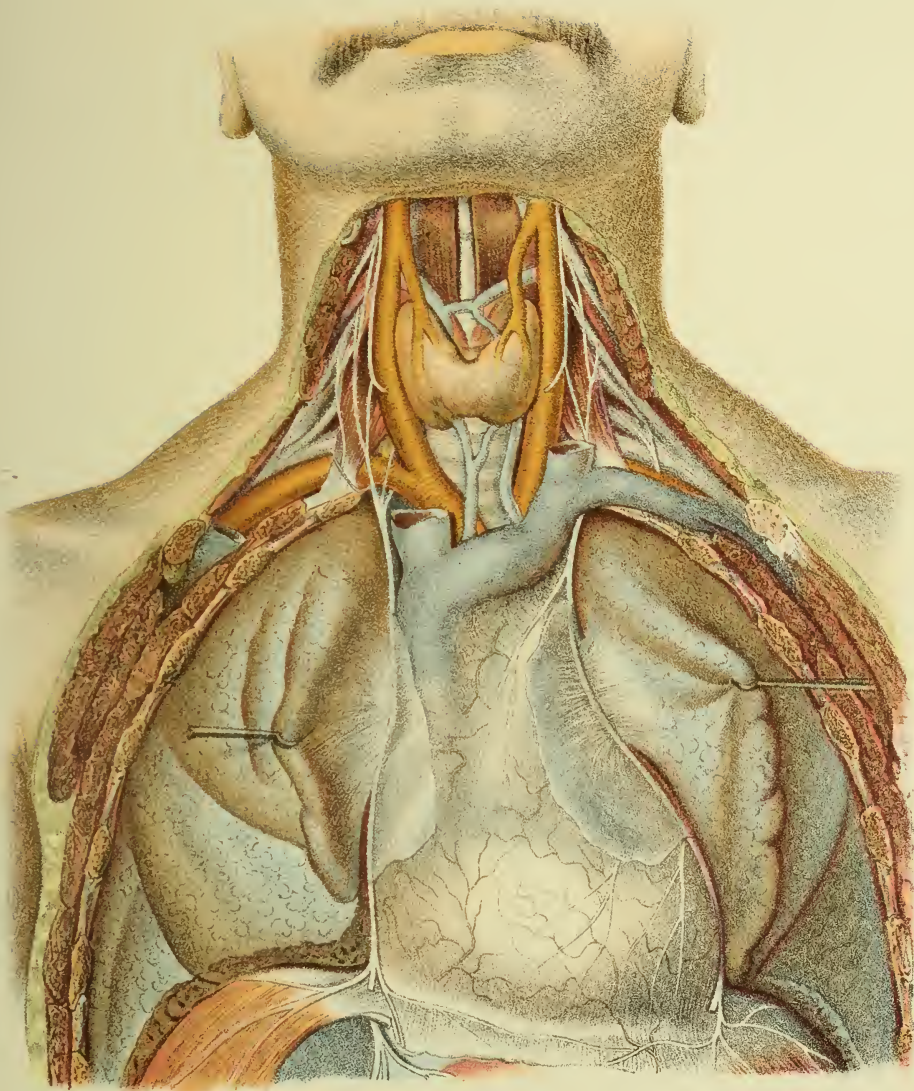
Pathological Anatomy.—The characteristic lesion of croupous pneumonia is to be found in the lungs, and is due to the deposit of an extensive fibrinous, hæmorrhagic exudate in the bronchioles and alveolar structure of the lungs. The lesion may involve one or more lobes to their whole extent, and, although it not uncommonly extends beyond the lobe, it is at times limited by the fibrous septa. The lower lobes are more frequently involved than the upper, and the right side oftener than the left. The upper lobes are sometimes alone involved and occasionally the right middle exclusively. The lesion frequently involves both sides, and the simultaneous implication of the lower lobe on one side and the upper lobe of the other constitutes what is known as crossed pneumonia. It is for the reason that one or more lobes are involved that the term lobar pneumonia is applied to the disease. As the result of this exudation the tissue of the lung is changed from an air-containing structure into one that is airless except in the larger bronchi.

In the series of 285 cases at the Philadelphia Hospital the lesion was distributed as follows:—

Right lower lobe.	Right middle lobe.	Right upper lobe.	Right middle and lower lobes.	Right middle and upper lobes.
83	3	24	20	9
Right upper, middle, and lower lobes.	Left lower lobe.	Left upper lobe.	Left upper and lower lobes.	Right and left lower lobes.
20	59	14	13	3
Right and left upper lobes.	Right upper and left lower lobes.	Left upper and right lower lobes.	Right upper and middle and left upper lobes.	
4	4	3	3	
Right upper, middle, lower, and left upper lobes.	Right upper, middle, lower, and left lower lobes.	Left lower and upper and right upper lobes.		
4	5	8		

The micro-organisms peculiar to erysipelas, to influenza, to tuberculosis, and to enteric fever may one and all give rise to a specific pneumonia or pneumonic fever. So also may Loeffler's diphtheria bacillus and the bacillus of malignant anthrax, as well as other pathogenic bacteria. J. W. Moore (Brit. Med. Jour., Jan. 1, '98).

In one additional case that died twenty-four hours after admission each lung was consolidated from apex to base and the autopsy showed that everywhere the lesion was in the same stage, so that this involvement of both lungs in their entirety must have taken place almost simultaneously.



The physiological importance of the Thyroid Gland, as illustrated by its vascular relations.

Thick anterior venous network dissected off to expose the Gland.

The anatomical changes pass through three stages: (1) the stage of engorgement, or congestion; (2) the stage of red hepatization, or consolidation; and (3) the stage of gray hepatization, or resolution. While these stages are more or less distinct, it must be understood that frequently in the same lung the three stages of the process may be existent at the same time.

In the stage of *engorgement, or congestion*, the lung becomes intensely hyperæmic, is dark red in color, and is markedly cedematous. The air, while diminished, is not absent from the air-vesicles. In this stage the alveoli are filling up with an abundant exudate, which is hæmorrhagic, but still fluid, so that the cut section upon pressure exudes a frothy serum, the lung-structure itself readily breaking down under the finger. Microscopically the capillaries are found to be dilated and tortuous. The alveolar epithelium is swelled and the alveoli contain free epithelium and white and red blood-corpuscles. While this stage may continue for several days, its usual duration is about twenty-four hours.

In the stage of *red hepatization, or consolidation*, the lung is deep red in color and is swelled to such a degree that upon its surface is frequently observed the indentations produced by the ribs. Its weight during this stage is greatly increased. The surface of the cut-section presents a finely granular appearance and it is now completely airless and sinks in water, while the tissue is extremely friable and readily breaks down under pressure. With a knife a tenacious, grayish-red fluid can be readily scraped off and from the small bronchi may thus be detached minute casts formed of coagulated exudate. On microscopical examination the contents of the alveoli are found to contain coagulated fibrin, red blood-

corpuscles, leucocytes, and granular epithelium.

The stage of *gray hepatization* develops gradually from the second stage of the anatomical process. The faintly-mottled appearance that characterizes the lung during the stage of red hepatization has now become more marked. The tissue remains solid, but this characteristic is less marked. The cut surface becomes smoother, losing its granular appearance as liquefaction of the alveolar contents takes place. Toward the end of this stage there is some re-entrance of air; so that upon pressure crepitation may be elicited. The fluid scraped from the cut section at this time is more abundant and is more milky in appearance, and in its general characteristics resembles pus. For this reason this stage has sometimes been called that of purulent infiltration. Microscopically the fibrinous exudate is found to have broken down, the red blood-corpuscles have disappeared, having become discolored or undergone absorption, while a marked increase in the number of leucocytes is to be observed. It is probably the absorption of the coloring matter of the red blood-corpuscles and the increase in the number of leucocytes which brings about the change in color of the lung in these two stages of the anatomical process.

The rejuvenation of the lost alveolar epithelium results from that which has survived, and ultimately entire restitution of the pulmonary tissues takes place. The three stages thus briefly described occupy no more than seven to ten days, and are accompanied by a plastic pleurisy which in the area of its distribution corresponds more or less closely to that of the pulmonary lesion, when it extends to the periphery of the lung.

Although the usual termination of croupous pneumonia is in resolution,

failure of complete restitution of the lung-structure to the normal frequently takes place. We find, therefore, that the purulent infiltration which succeeds upon the third stage may at times terminate in gangrene, and occasionally in abscess which may be either single or multiple. Of course, these conditions result from infection with secondary forms of bacteria. Again, resolution may be delayed, in some instances eventually returning to the normal, but in others never doing so, so that subsequently the involved area undergoes chronic fibroid change, the ultimate termination of which is occasionally in tubercular infection. This, however, is not to be regarded as due to any condition inseparable from or essential to the pneumonic process, but as dependent upon secondary infection with the tubercle bacillus.

A catarrhal bronchitis is frequently associated with croupous pneumonia, especially in the portions of the lung not directly involved by the lesion. The peribronchial and tracheal glands are frequently enlarged and softened. The heart is found to be distended with blood and clots of firm consistency, which are frequently withdrawn from the organ with some little difficulty owing to their entanglement among the trabeculæ. Distension of the right side of the heart with clots is especially marked. Pericarditis occurs not infrequently, and is apt to be associated with left-sided and double-sided pneumonia rather than with pneumonia of the right side. Pericardial exudation, which is frequently abundant, shows the presence of the pneumococcus. Ordinarily this exudation is fibrino-serous, but is occasionally purulent. Endocarditis is a more frequent complication of pneumonia than pericarditis, and not infrequently is of the ulcerative type, showing the presence of the pneumococ-

cus. Leptomeningitis is of not very frequent occurrence and usually happens in those cases also the subject of a malignant endocarditis. Meningeal inflammation in its distribution is usually cortical and in the exudation the pneumococci are frequently found. The spleen frequently undergoes enlargement, as in other infectious diseases, and is usually soft in consistence. Granular degeneration of the liver with extreme congestion of the organ is frequently to be observed. Parenchymatous degeneration of the kidneys also occurs.

Complications and Sequels.—Pleurisy is a constant accompaniment of croupous pneumonia whenever the pulmonary lesion reaches the periphery of the lung. In the vast majority of instances the involvement of the pleura results in a dry, plastic pleuritis, but in some cases a serous exudation occurs. The signs of effusion under these circumstances may be masked, and a positive diagnosis of the condition difficult without resort to aspiration. Owing to the resistance offered by the consolidated lung to the accumulating fluid, a very moderate effusion may lead to serious displacement of the adjacent viscera, particularly the heart. Its recognition under these circumstances is, of course, important, as aspiration may be necessary to relieve serious embarrassment of the circulation. Occasionally the effusion is purulent: an occurrence usually denoted by persistence of the fever and by the existence of marked leucocytosis. This is not an infrequent complication, statistics showing it to occur in about 1 per cent. of the cases. It has happened in my experience to see pulsating empyema a complication of pneumonia. Whether the effusion be serous or purulent, bacteriological examination of the exudate will usually discover the presence of the pneumococcus.

Pericarditis occurs in a considerable proportion of the cases, more particularly when pneumonia involves the left lung. It was found by Osler to occur in 5 per cent. of the cases. It is commonly fibrinous, although there may be considerable effusion, usually serous, but which in severe cases may be purulent. Usually the presence of the pneumococcus can be demonstrated in the exudate. Endocarditis is of more frequent occurrence and there is a marked tendency for the involvement of the endocardium to assume the malignant form. From the statistics collected by Osler 25 per cent., or 54 out of 209 cases of malignant endocarditis, occurred in pneumonia. It occurs more commonly in the left side of the heart than the right, and particularly attacks those the subjects of chronic valvular disease. Pneumococci may be found in the vegetations.

Literature of '96-'97-'98.

Rare case in which, in the course of lobar pneumonia, the signs of a malignant endocarditis manifested themselves associated with septic temperature, hyperpyrexia, and chills, though without any heart-murmur. At autopsy large thrombotic excrescences, the size of one's thumb, were found on the tricuspid valve. The other valves were free. Cultures gave a lanceolate diplococcus, positive to Gram, but larger than the usual Fraenkel-Weichselbaum organism. Finley and Wyatt Johnston (Phila. Med. Jour., May 7, '98).

Acute nephritis occurs in a small proportion of cases. It was a complication in 8 of the series of cases at the Philadelphia Hospital. Parotitis is a very infrequent complication, being observed in but 1 of the 285 cases occurring at the Philadelphia Hospital. Meningitis is an occasional complication. It occurred in but 1 of the above cases, though in 8 per cent. of the fatal cases reported by Osler.

Among the rare complications may be mentioned peripheral neuritis, arthritis, hæmorrhage from the mucous membranes, and hæmaturia. One attack of croupous pneumonia does not confer immunity against subsequent attacks; on the contrary, in no other acute disease is recurrence so likely to take place.

Literature of '96-'97-'98.

Attention called to rare complication of phlegmasia alba dolens in pneumonia. Three cases treated under observation and six collected from the literature. Of the 9, 5 were on the left side, 2 on the right, and 2 were bilateral. The prognosis is favorable, though the recovery may be tedious. The usual seat of the lesions is in the internal saphenous or in the femoral vein, or in both. J. M. Da Costa (Phila. Med. Jour., Sept. 10, '98).

Among the sequels of pneumonia abscess may occur from purulent infiltration of the lung-tissue. It is not of frequent occurrence, and shows itself by the expectoration of large quantities of purulent material, containing pulmonary elastic tissue. As the abscess increases in size the signs of a cavity become manifest. Gangrene of the lung is not a frequent sequel. It occurred in but 2 cases in the 285 at the Philadelphia Hospital. It reveals its existence by the horribly offensive odor of the expectoration and by the presence of elastic tissue, as well as by symptoms indicating constitutional infection. Resolution of the lung following pneumonia may be delayed, with final return to the normal condition. In some cases, however, the integrity of the lung may never be re-established. In these cases chronic fibroid changes may occur, resulting in marked retraction of the chest-wall.

Literature of '96-'97-'98.

Seven hundred and fifty undoubted cases of genuine fibrinous pneumonia

that have been treated in the Berlin City Hospital in the 7 years between 1890 and 1897 studied. There were 11 cases of abscess-formation following pneumonia; that is, in 1.5 per cent. of the cases. In 5 cases the pneumonia was complicated by empyema. Three cases presented outspoken gangrene. Induration of the lung occurred in 16 cases; that is, in 2.1 per cent.

There were 15 instances in which pneumonia and tuberculosis were present in combination, but in none of these were there evidences that the tuberculosis was caused by the pneumonia. Serous pleurisy was present in 8.7 per cent. of the cases; empyema in 4.5 per cent., and this became putrid in 4 cases. Bacteriological examination of the pus from the empyema in 26 cases disclosed the presence of pneumococci in 19 instances, 4 times in conjunction with streptococci. In the other cases streptococci and staphylococci were found. Fourteen cases were fatal. In 3 instances purulent mediastinitis complicated the pneumonia, and in all these cases pneumococci were found. Purulent pericarditis occurred in 7 cases, and these also yielded pneumococci. Bacteriological examination of the blood was made in 48 cases, and yielded negative results in 36; in 27 of the latter recovery ensued, while in 9 death. Twelve cases yielded positive results, and, of these 12, but 2 patients recovered. Of the 9 fatal cases in which the blood-examination yielded negative information, 4 were instances of double pneumonia and of the other 5 cases 3 were apex-pneumonias, 4 of the 5 patients being alcoholics and the fifth an aged woman. Endocarditis was seen 6 times as a complication. In 4 cases it was of verrucose form. In 5 cases cultures were made from the exudate upon the valves, and in 3 of these pneumococci were found in pure culture. Acute nephritis was observed in 6 cases also. Meningitis occurred in 5 cases, and in each case the pneumococcus was found in the exudate. Hans Sello (*Zeit. f. klin. Med.*, B. 36, H. 1, 2, '98).

Prognosis.—The prognosis of croupous pneumonia varies greatly in accordance

with the conditions with which it is associated. Under all circumstances a grave affection the death-rate is highest among those already debilitated by pre-existing disease, in alcoholics, and in the aged. In children and in robust young adults the prognosis is more favorable than under other conditions. In general, the death-rate may be said to be about 25 per cent. In the Philadelphia-Hospital series of 285 cases, in the majority of which the most unfavorable conditions of previous ill health, alcoholism, and complications were uncounted, the fatal cases numbered 147, a percentage of 51.9. The association of the disease, therefore, with any complication renders the prognosis graver. A very serious complication is endocarditis, either acute or chronic, while its association with chronic cardiac disease other than valvular, with pulmonary emphysema, with alcoholism, and its occurrence in the aged offer an unfavorable outlook. Meningitis as a complication gives an absolutely unfavorable prognosis. A lesion at the apex is more serious than when it occurs at the base, and, of course, the prognosis is graver when an extensive portion of the lung is involved. Double pneumonia, therefore, is a graver affection than when the lesion is limited to one lung or to one lobe of the lung.

Analysis of 10,000 cases of pneumonia treated in the London Hospital showing that the quantity of albumin in the urine is of considerable prognostic value and that those cases which commence with a severe gastro-intestinal attack are twice as liable to end fatally as those which exhibit the more usual initial rigor. The mortality of the disease was shown to be directly proportionate to the severity of the symptomatic fever. Fenwick (*Lancet*, Jan. 31, '91).

Literature of '96-'97-'98-'99.

A high temperature with a good pulse denotes that, although the disease is se-

vere, the tissues are reacting to it, and that probably it will exhaust itself in a short time. When, however, the pulse is rapid and the temperature high, it shows a less resistive power in the economy. On the other hand, should the temperature be considerably lower—38° C.—and the pulse rapid, it points to a severe degree of infection and little or no reaction on the part of the tissues. Thus, high temperature in pneumonia is not necessarily an alarming symptom. Donier (*Thèse de Lyon*, '98).

The pulse in the evening frequently takes on in pneumonia the hesitating character shown on the sphygmograph by a broken ascending line. This phenomenon is easily perceptible to the touch in severe cases of pneumonia. Its prognosis is very grave: it coincides with feeble arterial tension and cardiac failure due to myocarditis. Carrière (*Progrès Méd.*, June 24, '99).

An examination of the blood may afford valuable information as regards the prognosis. The significance of leucocytosis under these circumstances is thus summarized by Cabot: "In the prognosis the important point is that the absence of leucocytosis is a very bad sign, while its presence is neither good nor bad." It must be remembered, also, that in the very mildest cases we may find the same absence of leucocytosis which in any other but the mildest would be almost surely fatal. In the Philadelphia-Hospital cases death occurred in all in which leucocytosis was absent, while it also occurred in a case in which the leucocytes numbered 37,000.

The prognosis in those cases of croupous pneumonia in which leucocytosis is not present is very unfavorable. Von Jaksch (*Centralb. f. klin. Med.*, Feb. 6, '92).

Well-marked leucocytosis in lobar pneumonia, while in itself a favorable sign, does not assure that the disease will pursue a favorable course, but indicates usually a severe infection. A moderately-low degree is an extremely-

unfavorable sign. In severe cases absence of leucocytosis indicates, with rare exceptions, that the disease will prove fatal. Most cases of lobar pneumonia in which the lesion extends to the pericardium and peritoneum are attended with slight leucocytosis. Ewing (*N. Y. Med. Jour.*, Dec. 16, '93).

Death takes place in pneumonia as a result of failure of the heart, whether brought about by the action of the specific toxin of the disease or due to the gradual distension of the right ventricle, dependent upon the hepatization of the lung.

Literature of '96-'97-'98.

General death-rate for pneumonia considered to be 20 to 30 per cent. Above the age of 60 the mortality is from 50 to 80 per cent., while young people are prone to recover. The same is the case in robust healthy adults; for instance, the death-rate in the German army in over 40,000 cases was only 3.6 per cent. General debility, poor food, and alcoholism greatly increase the danger. Toxæmia is the most common cause of death; the symptoms may develop early and cause from the outset severe cerebral symptoms. The toxæmia may be severe and fatal, even with consolidation of only one-half a lobe, being, in reality, due to the action of the specific toxins on the heart-centres rather than on the muscular substance of the organ itself. The toxæmia outweighs all other elements in the prognosis of pneumonia. Osler (*Amer. Jour. Med. Sci.*, Jan., '97).

Treatment.—Pneumonia is to be regarded as a disease that runs a more or less typical course and as being self-limited. Of late, efforts have been made to treat the disease by the blood-serum of animals that have been rendered immune to the toxic influences of the pneumococcus. These experiments have been largely carried out by F. and G. Klemperer, but the effort of Welch (*Med. Rec.*, May 14, '98) to confirm the experiments of the Klemperers has not been attended

with marked success. He found that it was extremely difficult to demonstrate a toxin in the blood from those who had recovered from pneumonia, and that it is not true that an antitoxin appears in the blood at the time of the crisis of pneumonia, but, on the contrary, at that time the toxin is stronger, so that 1 $\frac{1}{2}$ cubic centimetres of the blood from a person convalescing from pneumonia three or four days after the crisis is rapidly fatal in small amounts to rabbits. It is also claimed by Vaughan (Med. Rec., May 14, '98) that the pneumotoxin was preventive of pneumonia but to a slight degree, and this only temporarily so, the result depending upon the amount of leucocytosis that existed at the time. He further states that there is no promise at the present time of making the pneumotoxin of therapeutic effect.

It is extremely doubtful if medicine influences in any way the course of pneumonia. The treatment, therefore, must be regarded as one of expectancy, with active treatment of symptoms as they arise. At the outset it must be stated that everything should be done to maintain the patient's strength, and that no medication should be resorted to that tends in the slightest way to embarrass the action of the heart. Such drugs, therefore, as aconite, veratrum viride, and the coal-tar antipyretics have none but a harmful influence.

Literature of '96-'97-'98.

The ordinary vigorous child who contracts pneumonia is more likely to recover than he is to die. As little medicine as possible should be given in these cases, and many recover when none is given. The diet is the principal thing. Food at regular intervals should be prescribed and its administration insisted upon.

In treating pneumonia in hospital practice the inhalation of steam under

a tent, and mustard paste relied upon. The latter is of great service, but should not be left on too long. F. M. Crandall (Med. News, Nov. 19, '98).

The frequency with which blood-letting was formerly resorted to calls for a word of caution. Only with great rarity is resort to this measure of treatment permissible. It is only in those cases of the so-called sthenic type in the young, robust adult attended with great activity of the circulation and full, tense pulse, cyanosis, and embarrassment to respiration that venesection should be employed, and then only in the early part of the disease. The result of blood-letting is but the alleviation of these symptoms; it has no effect upon the course of the disease, nor does it influence the extension of the lesion. Late in the course of pneumonia, when the right side of the heart appears to be greatly embarrassed, dyspnoea and cyanosis marked, with evidences of pulmonary oedema, as a last resort venesection may be employed. Very little is to be expected from it, however, and the alleviation of symptoms is but transitory.

Fever is a symptom frequently requiring treatment. For this purpose, however, medicinal antipyretics must not be employed. The greatest benefit will be found to accrue from the use of the various hydrotherapeutic measures at our command. Cold, therefore, in its various forms may be used, either as the cold sponge, in the form of cold compresses, or in the application of the ice pack to the affected side. Should the temperature be persistent and its range high, with marked intensity of nervous symptoms, the patient may be put into the full plunge-bath with the temperature of the water at 70° or 75° F. The systematic use of the cold bath, however,

in croupous pneumonia has not been attended with beneficial results.

Analysis presented of 1000 cases of pneumonia treated in the London Hospital during the decade ending 1890. Of these, 108 cases were treated by the application of cold in various ways. In 52 cases, half of which were treated with cold applications to the chest and the other half with the cold pack, the mortality was about 15 per cent. Cold sponging was used in 65 cases, with a mortality of 13 per cent. The ice-cradle was made use of in 43 cases, with a mortality of 7 per cent. Altogether, there were 108 cases treated by the application of cold in various ways, with a mortality of 10 per cent., the mortality by the other methods being more than double that by the cold treatment. With the latter treatment stimulants were also usually given. W. S. Fenwick (*Lancet*, Jan. 31, Feb. 7, '91).

Ice recommended in treatment of croupous pneumonia. The affected area—front, side, and back—continuously surrounded with rubber ice-bags well wrapped in towels. An ice-bag is also placed on the head, and from $\frac{1}{20}$ to $\frac{1}{25}$ grain of strychnine given by the mouth every three or four hours, with an injection of $\frac{1}{30}$ grain of the same drug once a day until its physiological action becomes apparent in restlessness. This may, perhaps, be first observed in the lower extremities. A tablespoonful of beef-powder in chocolate or coffee is a most valuable food in these cases, when given every three hours. Mays (*Med. News*, Jan. 21, '93).

There is danger of cold baths to infants with pneumonia, unless the technique be exact. Baths of 95° F. should be used, reduced not lower than 80° F. from ten to fifteen minutes, with friction. Baruch (*Archives of Ped.*, July, '93).

Cold water highly recommended in the treatment of pneumonia in children. A. Jacobi (*Archives of Ped.*, Apr., '93).

Excellent effects yielded by balneotherapy in the pneumonia of quite young infants. Applied at a temperature of 77° or 68° F., according to age and cir-

cumstances, the cold bath is most serviceable in reducing the temperature, restoring lost tone, and slowing the pulse and respiration. Comby (*Le Bull. Méd.*, May 19, '95).

Literature of '96-'97-'98.

In the Children's Hospital, Philadelphia, every patient with pneumonia receives a warm tub-bath at the outset, if the general condition permits of it. If not, he is sponged. He is then confined absolutely to bed. On the theory that croupous pneumonia, and probably broncho-pneumonia as well, is an infectious disease, no abortive or specific treatment is attempted. Should fever reach 104° or over, sponging with water of 70° or 80° is often employed, or a warm tub-bath is given. If the temperature of the child is still higher, the temperature of the water is reduced, or a cool tub-bath is given. When the respiration is becoming much embarrassed, the heart failing, and the general strength waning, a plunge from one to three minutes into a bath of 103° to 105° will often rouse the failing powers in a remarkable manner. Cotton jacket personally not employed. When there is much dyspnoea or pain, a hot, light poultice sometimes gives great relief. Counter-irritation is used occasionally, oftenest in the form of turpentine stupes to relieve pain. J. P. Crozer Griffith (*Archives of Ped.*, Apr., '96).

In the Children's Hospital, Boston, pneumonia patients are usually placed in the open ward with other patients. Care is taken to keep the air fresh and comfortably warmed; a poultice is never used in the hospital, the cotton-wool jacket is not at all common. Care is habitually taken that the child shall have food suited to its age and condition. E. M. Buckingham (*Archives of Ped.*, Apr., '96).

Cold bath used in 36 pneumonia cases in the Boston City Hospital. The baths were given very much as in typhoid fever, although they were not kept up so long, the duration generally being about ten minutes. Of the 36 cases, 28 recovered and 8 died, giving a mortality of 22.2 per cent. In the same hospital

there had been treated 355 cases of croupous pneumonia, with a mortality of 34.9 per cent., and this was about the average death-rate at that hospital. Of the 8 fatal cases, 1 had typhoid fever also, 1 had pleurisy, 3 had chronic alcoholism, 1 had general diplococcic infection (endocarditis, pericarditis, and meningitis), 1 had chronic nephritis, and 1 had phthisis.

In all but one case alcoholic stimulants were used. Folsom (*Amer. Medico-Surg. Bull.*, Dec. 19, '96).

Infectious pneumonia relieved by cold compresses. A napkin large enough to reach from the top of the sternum to the stomach and to cover the anterior and both lateral surfaces of the chest is dipped in cold water at a temperature of 46° to 50° F. and applied to the chest. At the end of five minutes it is replaced by a cold one, and this treatment is continued for an hour. After a half-hour's rest three similar series are carried out. Dyspnoea is relieved, as the treatment seems to be free from danger and is acceptable to the patients. Klein (*Bull. Gén. de Théor.*, 6e liv., p. 270, '97).

In pneumonia in children little treatment is necessary in most cases; but, whatever is done, a child with a temperature of 104° or 105° F., and respiration at 60 should not have a hot poultice tightly wrapped about its chest. Particular attention should be paid to the condition of the digestion and diet. Fresh air is also an essential. The restlessness and nervous symptoms should be relieved by the cold pack, care being taken to keep the extremities warm by means of hot bottles. W. P. Northrup (*Med. News*, Nov. 19, '98).

In the pneumonia of children the application of water is the safest and most satisfactory method of controlling dangerous hyperpyrexia. In order to be effectual, the cold to the head must be thoroughly and continuously applied. Finely-cracked ice placed in bladders may be molded around the head, especially at the vertex and occiput. Ice poultices made by mixing finely cracked ice with flaxseedmeal in oiled silk, placed around and on top of the head, are most valuable. Compresses may

be applied directly to the chest. The child is stripped, wrapped in a blanket, and placed upon a table. A stimulant is given, and the feet are placed in contact with hot bottles. A compress sufficiently large to surround the chest is plunged into water at a temperature of from 70° to 95° F., and applied to the chest. This is changed every ten or fifteen minutes until desired result is obtained. In order to disturb the child as little as possible, the nurse is directed to apply the compress from the front, tucking in the ends until they meet in the back. Addition of about one-fourth part of alcohol sometimes increases the value of these compresses. When the temperature is reduced to 102° or 103° F., the compresses should not be renewed, but are kept in position in case the temperature ascends again to an unsafe degree. In case of cyanotic children, with prostration and hyperpyrexia, the warm bath (100° F.) with friction of the surface has been applied with good results. Henry Dwight Chapin (*Med. News*, Nov. 19, '98).

Treatment of infantile pneumonia should be governed by the age of the patient, the severity of the infection, the extent of the pneumonic process, and the condition of the heart. Rapidity of the heart-beat indicates vigorous cardiac stimulation. For this purpose digitalis in 1/2-minim doses and strychnine in doses of 1/400 grain are most useful. In cases of acute cardiac failure hypodermics of alcohol are most valuable. Poultices are never to be employed. Opium is always contra-indicated. Baths are well borne in sthenic cases with hyperpyrexia. The temperature should be 85° at immersion, subsequently reduced to 75°. Baths, however, should never be repeated if they cause any weakening of the pulse. Alcohol is only used where there is cardiac weakness. Attention called to necessity for isolation, free ventilation, and the presence of the vapor of thymol, turpentine, or creasote in the atmosphere. Koplik (*Med. News*, Nov. 19, '98).

To maintain the heart's action is one of the most important indications in pneumonia. Of the remedies used for

this purpose alcohol is one of the most important, but it should not be given in a routine manner. When the heart-sounds become enfeebled, with a small pulse associated with low arterial tension, alcohol is strongly indicated. This remedy is especially valuable in those persons who have had an alcoholic history, and its administration in large doses may be necessary to avert an attack of delirium tremens. It will thus be seen that the amount of alcohol required in any case will vary, so that the dose is to be regulated by the effects produced. As supplementary to alcohol the sulphate of strychnine is of great value. It is best given subcutaneously, and its use should be restricted to such occasions when it is necessary to tide the patient over a critical period. It should be reserved, therefore, for those periods in the course of the disease when the patient's heart seems to be failing, and should not be given unless definitely indicated.

Literature of '96-'97-'98-'99.

In cardiac failure in pneumonia the remedies to be most relied upon are strychnine and digitalis, the latter to be given not in the larger doses recommended by Petresco, but in smaller doses associated with diffusible stimulants, such as ether, ammonia, or compound spirit of lavender. Henry L. Elsner (Ther. Gaz., June 15, '99).

Of great value is nitroglycerin in doses of $\frac{1}{100}$ grain repeated every two or three hours as indicated. By the use of this drug the peripheral resistance to the laboring heart is greatly lessened, and much of the strain placed upon this organ in its efforts to force the blood through the consolidated lung is removed by thus effecting the dilatation of the capillaries generally.

Literature of '96-'97-'98.

In some cases of pneumonia the outcome seemed to depend entirely upon the

ability of the right heart to move the mass of blood through the lung. These cases were marked by dyspnoea, cyanosis, and a generally congested condition of the vascular system. The right side of the heart would be found, on percussion, to be enlarged and there would be decided accentuation of the pulmonary second sound. In this class of cases nitroglycerin is of value. With increasing experience, more and more confidence is felt in strychnine as a cardiac stimulant. A. H. Smith (Med. News, Apr. 30, '98).

With the same object in view, Hayen recommends the use of amyl-nitrite in large doses by inhalation, and employs compresses upon which 15 drops of the pure drug are placed and held close to the nose and mouth while deep inspirations are being made. This may be repeated so that 50 drops are administered in the course of five hours. He advises the continuance of this treatment for a few days beyond defervescence.

Other remedies of value are the aromatic spirit of ammonia, carbonate of ammonia, and, in instances of sudden heart-failure, the administration of ether hypodermically. In other cases sulphate of atropine administered hypodermically will be found of distinct advantage in stimulating a flagging heart.

Treatment of pneumonia by large doses of digitalis has been strongly advocated by Petresco. This is a revival of the treatment first advocated by Traube and in which as much as 120 grains are administered in the course of forty-eight to sixty hours. Petresco claims that no ill-toward effects are caused by the use of the drug in these large doses, that if administered at the onset it will shorten the duration of the disease, and that in any event it is attended by a marked lowering of the death-rate. As pointed out by Aufrecht, however, as low a death-rate has been obtained by other methods of treatment. Thus, of 379 cases be-

tween the ages of fifteen and twenty years, taken from his series of 1501 cases, 11 terminated fatally: a mortality of 2.64 per cent. The same author quotes a series of cases reported by Risell in which, of 127 cases occurring in individuals in the second and third decades of life, only 2 terminated fatally, or a mortality of 1.8 per cent. The treatment in these cases was without digitalis. The danger of causing nausea and vomiting or producing the cumulative effects of digitalis is sufficient to militate against the use of the remedy, especially as it has not been clearly demonstrated that as good results are not obtained from other methods of treatment.

Literature of '96-'97-'98.

In treatment of pneumonia administration of 30 minims of tincture of digitalis every fourth hour, and in severe cases every hour or two, advised. The dose must be increased until the pulse is slow; otherwise its specific action does not take place. Alcoholic stimulants tend to inhibit the action of digitalis. M. Eustace (*Brit. Med. Jour.*, June 25, '98).

Specific action of digitalis on the pneumonia coccus established beyond a doubt. A very small amount will kill the cocci in a culture and also neutralize the toxicity of pneumonia toxin in injections. The doses given are 1 drachm of digitalis in infusion the first twenty-four hours, and in severe case another drachm in the second. Generally 3 to 4 drachms in infusion are given during the course of pneumonia. It is important to begin the treatment within the first three days of the disease. Maragliano (*Gazz. d. Osp. e d. Clin.*, No. 31, '98).

A symptom requiring treatment is pain. For its relief the subcutaneous administration of morphine may be resorted to. Should this prove objectionable, opium in some other form, as Dover's powder, may be administered by the mouth. The same measures of treat-

ment are indicated for the relief of the distressing cough which is so apt to increase the patient's suffering.

Literature of '96-'97-'98.

In a case of pneumonia with severe pain in the side in which injections of morphine could not be given, strips of adhesive plaster as in cases of fractured rib were employed with excellent results. Even the dyspnoea and the cough seemed to be mitigated. The strips used were of American adhesive plaster, not more than an inch and a half wide. Solberg (*Deut. med.-Zeit.*, Aug. 5, '97).

Much relief may be experienced from these symptoms by the application of an ice-bag to the affected side. Early in the course of the case counter-irritation to the affected side may be employed, or a few leeches or wet cups may be applied. Care must be taken, however, that blood shall not be withdrawn in sufficient quantity to cause any depression. If sleeplessness occur the administration of chloral may give relief. If there be headache or other marked cerebral symptoms, an ice-cap to the head should be used, and if these symptoms are attended with hyperpyrexia the administration of a cold bath may be advisable. In severe cases where the lesion is extensive and attended with decided dyspnoea and cyanosis some relief of these symptoms may be obtained by the free administration of oxygen. The use of this remedy is also frequently attended with improvement of the nervous symptoms, and appears in some cases to lend strength to the heart's action.

Inhalation of oxygen and hypodermic injection of strychnine recommended as respiratory stimulants in pneumonia. Lauder Brunton and Prickett (*Brit. Med. Jour.*, Jan. 23, '92).

In addition to the usual treatment every effort should be made to combat the oligæmia. Large quantities of fluids should be supplied to the system through every available channel, even in the form

of saline infusions. This should be done at an early period before collapse symptoms have manifested themselves. Bolinger (*Münch. med. Woch.*, Aug. 6, '95).

Literature of '96-'97-'98-'99.

Pilocarpine employed according to method of Sziklai in treatment of 9 cases of croupous pneumonia, and at the same time 16 cases treated by expectant method for purpose of comparison. Both groups completed convalescence in about the same time, the usual period of resorption being from 6 to 12 days. The only real difference between the two groups was that the physiological symptoms of pilocarpine were invariably very pronounced, and the sweating and salivation were so severe as to render the patients miserable both day and night. Rosenbergen (*Deut. Archiv f. klin. Med.*, Dec. 22, '97).

In pneumonia very rapid and satisfactory results can be obtained by applying the spinal hot-water bag, or its equivalent in heat and moisture, over the dorsal sympathetic ganglia. A double columned hot-water bag may be applied, or two rows of flannel may be used (being first dipped in water no hotter than 120° F.) instead of the hot-water bag: the space of one inch should be left between the rolls, so that the heat will not cover the spinal vertebræ direct. One yard of flannel, eight inches wide, rolled evenly from each end toward the centre until the space of one inch remains between the rolls, may then be sewed so that they will not unroll. They should be wrung out after dipping in water at 120° F., and then quickly applied between the shoulders, covered with a thick dry towel, and the patient told to press against them. The application when flannel is used should be changed every twenty minutes, until decided relief is obtained. It may then be removed until there are signs of a renewal of the symptoms. B. O. Kinnear (*Boston Med. and Surg. Jour.*, Dec. 2, '97).

One hundred cases of pneumonia treated with only one death. To all of these cases was administered salicylic acid, sometimes alone, sometimes in com-

bination with other remedies. From 8 to 10 grains every two hours were employed. Salicylic acid believed to be specific for lobar pneumonia. C. Sebring (*Med. Rec.*, Apr. 22, '99).

A series of cases of broncho-pneumonia in children successfully treated with large doses of belladonna, no other medication being required. Of several dozen patients so treated only 2 died. Stress is laid on 2 points: 1. The amount given should be large. 2. The tincture of belladonna is not to be used, but preferably the extract. The dose is $\frac{1}{4}$ grain every 3 or 4 hours. This dosage applies equally to infants and older children. J. A. Coutts (*Brit. Med. Jour.*, No. 1987, p. 207, '99).

The intravenous injection of saline solutions has in the hands of some given good results. Bassi (*Gazz. degli Osped.*, June 6, '96) reports 6 cases of severe acute pneumonia treated after the method of Galvagni by the endovenous injection of a solution of chloride and bicarbonate of sodium. In each case the pneumonia was double and of the grave type, and of the 6 cases 5 recovered and 1 died. It is claimed that the best time to give the injection is about a day before the expected crisis, or when the pulse becomes intermittent, or upon any grave alteration in the condition of the patient. A small preliminary bleeding is held to be useful.

Any tendency to collapse at the time of the crisis must be carefully watched, and it may then be necessary to apply external heat and to administer diffusible stimulants by the mouth or subcutaneously. It should be borne in mind that pleural effusion associated with croupous pneumonia, even though the amount of exudate be small, may give rise to serious pressure symptoms. Early resort to aspiration of the pleural cavity in such cases must be resorted to.

Diarrhœa, which frequently occurs in croupous pneumonia, calls for no special

treatment, and constipation, should it occur, is readily overcome by the administration of calomel or a saline.

The diet throughout should be systematically administered and only such articles of food as are of ready assimilation should be given.

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PNEUMONOKONIOSIS.

Definition and Varieties.—This is a term applied to the proliferative interstitial inflammation of various pulmonary structures caused by the continued inhalation of dusts of different kinds. The three principal forms of pneumokoniosis are *anthracosis*, or coal-miners' disease, due to the inhalation of coal-dust; *chalicosis*, or stone-cutters' phthisis, brought on by the inhalation of mineral dusts; and *siderosis*, due to the inhalation of iron oxide and other metallic particles. Clinically, pneumokoniosis may be considered as a combination of chronic bronchitis, emphysema, and phthisis, which not infrequently assumes the tuberculous type.

Symptoms.—The manifestations of the three forms of pneumokoniosis are practically similar. Three stages may be distinguished. During the first there is general uneasiness, anorexia, loss of flesh, paroxysmal cough, and expectoration, varying to a degree, in color, with the kind of dust inhaled. In anthracosis the sputa are black, in chalicosis they are grayish black, while in siderosis they are red. In all three forms hæmoptysis usually occurs, but this symptom is more frequently observed and the hæmorrhages are likely to be more copious in chalicosis. Auscultation shows that the vesicular breathing murmur is lessened during this stage, while vocal resonance is enhanced; sibilant râles are usually

detectable. The signs of chronic bronchitis become clearly defined during the second stage, and dyspnœa and vomiting are now added to the symptoms already outlined. The sputa not only show their characteristic coloring, but they become muco-purulent, while the hæmoptyses become relatively more frequent and copious. Symptoms of emphysema are now superadded, and the dyspnœa becomes asthmatic in character. The third stage is characterized by rapidly-increasing anæmia; cavities may then usually be detected, along with all the symptoms of pulmonary tuberculosis, with all its attending manifestations, night-sweats, diarrhœa, hectic fever, intense dyspnœa, and copious expectoration in which the tubercle bacillus is often found, and the patient succumbs. The third stage may not be reached, however, if the patient is relieved of the exposure to the causative elements in time; on the other hand, the usual manifestations may be replaced by those of some other local disease, particularly lymphosarcoma or other malignant growths of the lung.

Etiology.—Anthracosis not only occurs among coal-miners, but also among laborers who inhale much coal-dust. Molders of bronze, iron, and copper also suffer when coal-dust is employed by them. Chalicosis is observed among stone-cutters and potters particularly. Siderosis occurs in those who inhale iron filings and the oxide of iron, polishers, gold-beaters, and other crafts in which iron is more or less utilized.

Pathology.—The inhalation of air thickly laden with the foreign agents mentioned, after a prolonged period of exposure, gradually weakens and finally overcomes the physiological functions calculated to protect the bronchial mucosa. The ciliated epithelium, the

phagocytes, and the mucous and alveolar cells represent as many structures upon whose integrity these functions depend. When these cannot be performed, the mucous membrane of the respiratory tract is penetrated and the foreign bodies invade the lymph-spaces, which represent a second barrier and are capable of disposing of comparatively enormous quantities of intruding substances. When this line of defense is overcome, however, many particles are carried to the lymph-nodes surrounding the bronchi and the blood-vessels and to the interlobular septa under the pleura, where they accumulate between the tissue-elements, and, through the larger lymph-channels, to the substernal, bronchial, and tracheal glands, in which the stroma-cells of the follicular cords dispose of them permanently and prevent them from entering the general circulation (Arnold, quoted by Osler). When the pigmented bronchial glands become adherent to the pulmonary veins, however, the foreign particles may invade the general circulation and be found in remote organs, the liver and spleen especially (Wiegert).

When the limit of tolerance is reached, an interstitial sclerosis begins in the bronchial glands and periarterial lymph-nodes. These gradually harden, and coalesce until large fibroid areas—cirrhotic masses—are found in various parts of the organ. Post-mortem, such masses, when cut, are quite resistant, and sink in water and color it black. The fingers of the operator become blackened likewise, the cut surfaces appearing either black or marble-like. The bronchi are seldom found dilated, but the finer arterial supply is often obliterated, and cavities are formed, mainly through the arrest of nutrition. The pleura is often thickened and le-

sions of the right heart are often observed (Dieulafoy).

Treatment.—Unless removal to hygienic surroundings early in the history of the case can be carried out, pneumokoniosis progresses steadily. Anthracosis advances slowly, but chalicosis is usually fatal after three or four years. In siderosis the duration of life is somewhat longer. If the patient cannot be removed elsewhere and finds himself obliged to continue his occupation, the wearing of appropriate masks or respirators may stay the progress of the disease. Free ventilation of shops, mines, etc., is also prophylactic in this particular; but total change of occupation is the only absolute protective. The disease is often arrested when this can be done. Iodide of potassium and the measures indicated in chronic bronchitis (*q. v.*) have given excellent results when hygienic surroundings are within the reach of the patient.

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PNEUMOPERICARDIUM. See PERICARDIUM.

PODOPHYLLUM.—Podophyllum, U. S. P. (mandrake, or May-apple), is the rhizome and rootlets of *Podophyllum peltatum* (nat. ord., *Berberidæ*): a plant indigenous to the United States and Canada. This plant contains about 4 per cent. of resin, a coloring principle,—saponin,—gum, starch, gallic acid, fixed oil, salts, etc. It contains no distinctive alkaloid; berberine, however, is present. The active principle, according to Podwissotsky, is a neutral crystalline body,—picropodophyllin,—which exists in combination with picropodophyllic acid; the resulting combination he calls podophyllotoxin.

Podophyllotoxin occurs in small, whitish-yellow lumps or powder, having a very bitter taste, and is soluble in alcohol, ether, chloroform, and hot water, but is precipitated from alcoholic solutions by cold water in excess.

The official resin of podophyllum consists, in reality, of two resins: one is soluble in both ether and alcohol, the other only in alcohol. The former, present to the extent of 75 to 80 per cent., is the active part. It occurs in light-yellow powder or in small, yellowish, bulky, fragile lumps, having a faint odor and an acrid, bitter taste. The resin is very irritating to the eyes and may cause conjunctivitis.

Preparations and Doses.—Podophyllum, U. S. P. (seldom used), 5 to 20 grains.

Extractum podophylli, U. S. P. (solid extract), 1 to 5 grains.

Extractum podophylli fluidum, U. S. P. (fluid extract), 5 to 15 minims.

Resina podophylli, U. S. P. (resin), $\frac{1}{8}$ to 2 grains.

Pilulæ catharticæ vegetabiles, U. S. P. (vegetable cathartic pills: compound extract of colocynth, 1 grain; extracts of hyoseyamus and jalap, of each, $\frac{1}{2}$ grain; extract of leptandra and resin of podophyllum, of each, $\frac{1}{4}$ grain; oil of peppermint, $\frac{1}{8}$ grain), 1 to 5 pills.

Podophyllotoxin, $\frac{1}{12}$ to $\frac{1}{8}$ grain.

Poisoning by Podophyllum.—Podophyllum, or podophyllotoxin, in large doses is a drastic cathartic; in toxic doses it causes violent gastro-enteritis, with vomiting, excessive purging, violent abdominal pain, and collapse or convulsions.

The treatment consists of opium to relieve the pain and check peristalsis, stimulants to sustain the patient, and demulcent drinks to soothe the irritated mucous membrane. Other indications

will be afforded by the symptoms in each case.

Therapeutics.—Podophyllum is a useful cathartic in constipation when the glandular secretions of the intestines and liver are deficient. Habitual constipation due to impaired action of the muscular coat of the bowel may be removed by the nightly use of a small dose of the resin, $\frac{1}{4}$ to $\frac{1}{2}$ grain, combined with the extract of belladonna, $\frac{1}{4}$ grain, and the extract of physostigma, $\frac{1}{4}$ grain (Bartholow). Bleeding hæmorrhoids caused by stasis in the portal circulation, if of recent formation, may sometimes be cured by a full dose of podophyllum ($\frac{1}{2}$ to 1 grain). Podophyllum is useful in a variety of hepatic disorders: in functional hepatic disturbances, portal congestion, and catarrhal jaundice. The digestive disturbances of malarial infection may be relieved by a podophyllum purgation. Sick headache associated with loose and dark-colored stools are amenable to podophyllum.

The smallness of the dose and slight taste of the resin make it serviceable in the treatment of constipation in young children or in diarrhœa due to diminished secretion. When hard, stony stools occur in children one or two months old, a grain of the resin may be dissolved in a drachm of alcohol (or spirit of ginger) and 2 drops or more of this on sugar may be given once or twice a day. In the summer diarrhœa of children, with watery passages having a musty or mousy odor, the resin may be given in doses of $\frac{1}{60}$ to $\frac{1}{50}$ grain repeated each few hours. In these small doses the resin will often stop vomiting if the liver is torpid and the stomach depressed. It is obvious that it should not be given if the vomiting is due to gastric irritation or inflammation.

POLIOMYELITIS. See SPINAL CORD.

POLYPUS. See NASAL CAVITIES, EXTERNAL EAR, UTERUS, etc.

PORRO'S OPERATION. See OVARIES.

POTASSIUM.—Potassium, or kalium, is a white metal, discovered by Sir Humphry Davy in 1807, having the consistence of wax; the fresh-cut surface has a silvery lustre, rapidly changing by oxidation to bluish or gray. Its affinity for oxygen is very strong. Exposed to the air, it oxidizes instantly. Thrown upon water, it takes fire spontaneously, and burns with a beautiful purple flame, yielding an alkaline solution of potassa, or potassium hydrate. Potassium hydrate, or potassa, is a strong alkaline base, very deliquescent, and soluble in half its weight of water. From this base the medicinal preparations are made. The metal is never used in medicine. Some of the preparations are strongly alkaline and have a high diffusive power; this group contains potassa, potassa with lime, potassium carbonate and bicarbonate. A second series is neutral in reaction and alkaligenous (become alkaline by decomposition, the vegetable acid being replaced by carbonic acid, and an alkaline carbonate being formed); this group contains potassium acetate and citrate, of high diffusive power, and potassium and sodium tartrate and potassium tartrate, of low diffusive power. A third series is permanently neutral or acid; this group contains potassium bitartrate and sulphate, of low diffusive power, and the nitrate, chlorate, bichromate, and iodide, of high diffusive power.

Upon a therapeutic basis, another useful classification may be made.

Caustics: potassa, potassa with lime, and potassium bichromate.

Purgatives: potassium bitartrate (4 to 8 drachms), potassium and sodium tartrate ($\frac{1}{2}$ to 1 ounce), the acetate (2 to 4 drachms), and the sulphate ($\frac{1}{2}$ to 4 drachms).

Systemic antacids: the carbonate (10 to 30 grains), the bicarbonate (20 to 60 grains), the solution of the citrate (1 to 8 drachms), the acetate ($\frac{1}{4}$ to $1\frac{1}{2}$ drachms), and the tartrate of potassa and soda (20 to 40 grains).

Diuretics: the bitartrate (1 to 2 drachms), the tartrate of potassa and soda ($\frac{1}{2}$ to 1 drachm), the acetate ($\frac{1}{4}$ to 1 drachm), the citrate ($\frac{1}{4}$ to 1 drachm), the carbonates ($\frac{1}{8}$ to 1 drachm), the nitrate ($\frac{1}{6}$ to $\frac{1}{2}$ drachm), and the iodide ($\frac{1}{12}$ to 1 drachm).

Febrifuges: the solution of the citrate (1 to 8 drachms), the citrate (20 to 30 grains), and the nitrate (10 to 30 grains).

Alkaline lotions: solutions of the carbonate and the bicarbonate (1 to 2 drachms to 1 pint).

Anti-emetic: the citrate of potassa ($\frac{1}{4}$ to 1 drachm).

Preparations and Doses.—Potassa, U. S. P. (potassium hydrate, or hydroxide; caustic potash).

Liquor potassæ, U. S. P. (solution of potassa, 5 per cent.), 10 to 30 minims.

Potassa cum calce, U. S. P. (Vienna paste or caustic—potassa, 50 per cent.; lime, 50 per cent.).

Potassa sulphurata, U. S. P. (sulphurated potassa; liver of sulphur), $\frac{1}{2}$ to 5 grains. (See SULPHUR.)

Potassii acetas, U. S. P. (acetate of potash), 10 to 60 grains.

Potassii bicarbonas, U. S. P. (bicarbonate of potash), 10 to 60 grains.

Potassii bichromas, U. S. P. (bichromate of potash), $\frac{1}{10}$ to 1 grain.

Potassii bitartras, U. S. P. (bitartrate of potash; cream of tartar), 1 to 8 drachms.

Pulvis jalape compoſitus, U. S. P. (potassium bitartrate, 65 per cent.; jalap, 35 per cent.), $\frac{1}{4}$ to 1 drachm. (See JALAP.)

Potassii bromidum, U. S. P. (bromide of potash), 10 to 60 grains. (See BROMINE.)

Potassii carbonas, U. S. P. (carbonate of potash), 10 to 30 grains.

Potassii chloras, U. S. P. (chlorate of potash), 5 to 10 grains.

Trochisci potassii chloras, U. S. P. (chlorate of potash, 5 grains), 1 to 5 troches.

Potassii citras, U. S. P. (citrate of potash), 15 to 60 grains.

Liquor potassii citratis, U. S. P. (solution of citrate of potash), 1 to 8 drachms.

Potassii citras effervescens, U. S. P. (effervescent citrate of potash), 30 to 60 grains.

Potassii cyanadum, U. S. P. (cyanide of potash, 90 per cent.), $\frac{1}{8}$ to $\frac{1}{4}$ grain.

Potassii et sodii tartras, U. S. P. (tartrate of potash and soda, Rochelle salt), 1 to 8 drachms.

Pulvis effervescens compoſitus, U. S. P. (Sedlitz powder: soda bicarbonate, 4 grains, and sal Rochelle, 3 drachms, in blue paper; tartaric acid, 33 grains, in white paper), 1 to 3 powders.

Potassii ferrocyanidum, U. S. P. (ferrocyanide, or yellow prussiate, of potash), 10 to 30 grains.

Potassii hypophosphis, U. S. P. (hypophosphite of potash), 3 to 30 grains. (See PHOSPHORS.)

Syrupus hypophosphitum, U. S. P. (syrup of the hypophosphites), 1 to 3 drachms. (See PHOSPHORS.)

Syrupus hypophosphitum cum ferro, U. S. P. (syrup of the hypophosphites with iron), $\frac{1}{2}$ to 1 $\frac{1}{2}$ drachms. (See PHOSPHORS.)

Potassii iodidum, U. S. P. (iodide of potash), 3 to 60 grains. (See IODINE.)

Unguentum potassii iodidum, U. S. P. (iodide of potash, 15 per cent.). (See IODINE.)

Potassii nitras, U. S. P. (nitrate of potash, saltpeter, sal prunella), 10 to 30 grains.

Argentii nitras dilutus, U. S. P. (mitigated caustic). (See SILVER.)

Charta potassii nitratis, U. S. P. (paper dipped in 30-per-cent. solution of nitrate of potash).

Potassii permanganas, U. S. P. (permanganate of potash), $\frac{1}{4}$ to 3 grains. (See MANGANESE.)

Potassii sulphas, U. S. P. (sulphate of potash), $\frac{1}{4}$ to 4 drachms.

Antimonii et potassii tartras, U. S. P. (tartar emetic), $\frac{1}{16}$ to 1 grain.

Ferri et potassii tartras, U. S. P. (tartrate of iron and potash), 10 to 30 grains. (See IRON.)

Liquor potassii arsenitis, U. S. P. (Fowler's solution of arsenic, 1 per cent.), 3 to 10 minims. (See ARSENIC.)

Poisoning by Potassium and its Salts.

—Potassium and its salts are rarely used for suicidal purposes. They are, however, extensively used in the arts, in the manufacture of glass and soap, under the name of potash and pearlash, and soaps, lyes, and in the form of concentrated lye for household purposes; sickness and occasionally death have occurred as the result of taking them accidentally.

Potassa.—The symptoms of poisoning by potash or lye are an acrid, numbing taste, followed by a burning heat in the throat and stomach, severe abdominal pains, vomiting, and purging. Forty grains of caustic potash in solution have caused death. Death may take place within a few hours or days from laryngeal spasm or edema, shock or cardiac paralysis, or it may be protracted several months from inflammation of the stomach and intestines, or stomatic discor-

ders produced by cicatrization). (See ESOPHAGUS.)

The treatment for poisoning by caustic potash consists in the evacuation of the stomach and administration of a vegetable acid,—acetic, citric, or tartaric,—in the form of vinegar, cider, or lemon-juice, which neutralizes the alkali and forms neutral salts. The fixed oils, which with potash form soap, should be given. Demulcent drinks will soothe the congested alimentary canal, digitalis and stimulants (hypodermically) will sustain the heart, and opium will alleviate the pain, control the purging, and lessen the inflammatory symptoms.

POTASSIUM BICHROMATE.—The bichromate of potash is also an irritant corrosive poison. The symptoms of poisoning by this substance are yellow stains about the body and clothes, restlessness, violent abdominal pain, vomiting, purging, and collapse. Death occurs from cardiac paralysis. The treatment consists in the evacuation of the stomach and bowels, the administration of chalk, soap-suds, and milk, or albumin, and the use of demulcent drinks and opium.

POTASSIUM BROMIDE.—This salt occasionally causes gastralgia when taken upon an empty stomach. This may be relieved by hot drinks and carminatives. (See BROMIDES.)

POTASSIUM CHLORATE.—In large doses chlorate of potassium exerts a paralyzing effect upon the spinal cord, but has a more profound action upon the blood, disintegrating the corpuscles and making it of a chocolate color. In poisonous doses vomiting with hæmatemesis, delirium, hæmatogenous jaundice, and coma result. The bodily temperature is markedly depressed, and rigors, cyanosis, and great muscular weakness are usually present. Death occurs from the depression of the vital powers, due to its destructive

action upon the blood and the congestive obstruction of the kidneys.

In addition to the above symptom the appearance of small, punctiform, hæmorrhagic spots on the legs and extending to the trunk and upper extremities has been observed as late as the sixteenth day.

Literature of '96-'97-'98.

The use of potassium chlorate, even as a gargle, should be entirely given up and forbidden. Even in small doses it is a severe blood poison, and may produce an hæmorrhagic nephritis. P. Jacob (Berl. klin. Woch., July 5, '97).

Treatment of Poisoning by Potassium Chlorate.—Two symptoms have been pointed out by F. Forchheimer as being a warning for the stoppage of this drug: drowsiness and a scantiness of suppression of the urine. Landerer advises, as the best treatment, venesection followed by infusions of normal salt solution, or, better, of defibrinated blood. In addition we may suggest, further, the use of saline purgatives and diuretics, especially caffeine and calomel, with hot baths.

POTASSIUM CYANIDE.—The symptoms and treatment of poisoning by this drug are those of hydrocyanic-acid poisoning (see HYDROCYANIC ACID). The prompt administration of alkalies are advised to prevent the decomposition of this salt by the gastric juice. The stomach and intestinal canal should be evacuated as soon as possible and arterial stimulants (coffee, ammonia, caffeine) administered. Cold affusions to the spine and friction of the extremities are indicated. Death has occurred from 3 grains of this drug.

Literature of '96-'97-'98.

Morphine seems to be the antidote to the cyanide of potassium, and *vice versa*.

With regard to the mechanism of the neutralization of these two poisons, it is thought that, owing to the influence of

the iron in the blood, which is an alkaline medium, there are formed Prussian blue and an oxide of morphine. Heim (Münch. med. Woch., No. 37, '96).

Acids should not be taken after the ingestion of potassium ferrocyanide, as it is decomposed even by weak acids, with the liberation of hydrocyanic acid.

POTASSIUM NITRATE.—In large doses this substance is an irritant poison. Death has occurred from one ounce. The poisonous symptoms are intense abdominal pain, vomiting, coldness of the extremities, diminished body-heat, partial paralysis, tremors, convulsions, and collapse. This drug has a paralyzing influence upon the spinal cord, which is evidenced by great muscular weakness and a reduction of reflex sensibility. Death usually occurs from cardiac paralysis or from collapse due to the irritant action of the drug upon the gastro-intestinal mucous membrane.

There is no chemical or physiological antidote. The treatment of poisoning should begin with the evacuation of the stomach. Mucilaginous drinks may be given, and external warmth applied to the body. Cardiac stimulants (amyl-nitrite, caffeine, atropine) are needed to sustain the heart.

POTASSIUM SULPHATE AND TARTRATES.—These salts in large doses act as irritant poisons, producing severe abdominal pain, vomiting, etc. The treatment of poisoning by these salts consists in the evacuation of the stomach and the administration of warm demulcent drinks and opium. Cardiac stimulants may be needed, and warm external applications are usually indicated.

Therapeutics.

Caustics.—The caustic alkalies possess a very high diffusive power, and penetrate and destroy the tissues widely and deeply; so that certain precautions

should be observed in their use lest the amount of tissue destroyed be larger than desired. When potassa is used as a caustic, the surrounding parts should be protected by adhesive plaster in one or more layers, a central hole having been cut out through which the caustic may have access to the skin. The size of the hole should be rather less than the area to be acted upon, as the eschar is apt to be larger than the area to which the caustic has been applied. The caustic in the form of the fused potassa is moistened slightly and rubbed firmly upon the surface till it assumes a dull-bluish look, and till the cuticle is softened and easily rubs off. The spot should then be washed with dilute vinegar, to neutralize any of the remaining alkali, and a poultice applied to facilitate the separation of the slough and to ease the pain.

Potassa alone is often more powerful than is desired, and it is commonly combined with quicklime, forming potassa cum calce, or Vienna paste, which must be moistened with alcohol before use.

Potash and Vienna paste have been extensively used to destroy cancerous growths, to limit sloughing ulcers, to remove the thickened, indurated edges of chronic ulcers, and to open boils, carbuncles, and indolent or deep-seated abscesses. They are said to prevent scarring. They have also been employed in the treatment of warts, nævi, malignant pustules, and phagedæna. Caustic potash has been used by surgeons in the post-operative treatment of fistula in ano, to keep the cut edges apart until the deeper parts of the wound are filled with granulations.

INGROWING TOE-NAIL may be treated successfully by painting the offending portion of nail with a solution of potash (25 per cent. to 40 per cent.). In a few seconds the upper layer of the nail will

become soft enough that it can be easily scraped off with a piece of broken glass. This operation is repeated until only a thin scale of the nail remains, which may be excised with a pair of fine scissors.

FELONS.—Liquor potassæ has been used externally in the treatment of felons. The undiluted solution, painted on the felon every hour or two in its early stages, in many cases will abort it. Poul-tices containing a considerable quantity of unleached wood-ashes is used for the same purposes by the laity, with good results.

In a diluted form, liquor potassæ is used in cutaneous affections characterized by acid secretions and to remove crusts, etc.

Potassium bichromate, another member of this group, is used in saturated solutions for the removal of corns, warts, venereal vegetations, and mucous patches.

Literature of '96-'97-'98.

Potassium bichromate used with good results in treatment of warts, which are to be painted once a day with a saturated solution in boiling water. A certain amount of bichromate is precipitated when the solution cools, and this should be discarded and the liquid applied cool. Louvel-Dulongpre (Treatment, vol. i, No. 15, p. 356).

In a 1-per-cent. solution it is an astringent and deodorizer. This salt is used in the preparation of the battery-fluid used in zinc-and-carbon batteries, and is made as follows: 6 ounces of this salt are dissolved in 3 pints of water, and 6 fluidounces of commercial sulphuric acid are very slowly added to the solution. Müller's fluid, used for the preservation of anatomical and pathological specimens, is composed of 3 parts of potassium bichromate, 1 part of sodium sulphate, and 100 parts of water.

Systemic Antacids.—The members of this group are used to neutralize an excess of acidity acting locally in the alimentary canal or through the blood upon systemic disorders due to or aggravated by the presence of undue acidity.

DISORDERS OF DIGESTION.—In acid dyspepsia associated with heartburn and pyrosis large doses of potassium bicarbonate (20 to 30 grains) will be found useful. In acid dyspepsia with pain or vertigo Robin advises the following: Potassium bitartrate, 3 drachms; sublimed sulphur, $1\frac{1}{4}$ drachms; precipitated chalk, $\frac{1}{2}$ drachm; Dover's powder, 15 grains; mix and divide into 10 powders, one to be taken after each meal.

In atonic dyspepsia small doses of the bicarbonate will stimulate the secretion of the gastric juice.

In some cases of gastralgia potassium bicarbonate in full doses given in some effervescent water will afford prompt relief.

The indigestion of obese persons, especially if they are rheumatic or gouty, will be relieved by full doses of bicarbonate given after meals, in full glass of water or, better, carbonic-acid water. The bicarbonate will not only prevent the formation of butyric acid, but will, moreover, also assist in emulsionizing the fats and in their absorption.

In acid diarrhœa potassium bicarbonate is an efficient remedy.

DISORDERS OF RESPIRATORY TRACT.—In bronchitis, especially in rheumatic and gouty persons, liquor potassæ is a good addition to the cough-mixture. J. V. Shoemaker gives the following: Liq. potassæ, 1 drachm; syrup of senega, 1 ounce; compound mixture of licorice, enough to make 6 ounces. Of this a deserts-poonful, in a wineglassful of water, is given every three hours when the expectoration is tough and scanty.

In pertussis potassium carbonate has been found valuable, given in doses of 1 or 2 grains several times a day.

GENITO-URINARY DISORDERS.—In gonorrhœa, as the urine is rendered alkaline under its use, liquor potassæ is frequently combined with other remedies, as in the following: Liq. potassæ, balsam of copaiba, of each, 6 drachms; mucilage of acacia, 3 ounces; spirit of nitrous ether, 6 drachms; tincture of opium, 1 drachm; water, enough to make 6 ounces; of this a tablespoonful, well diluted, is given three or four times a day in acute gonorrhœa.

In cystitis and pyelitis the same combination will be found serviceable. If in cystitis alkaline decomposition has set in, the use of alkaline remedies will aggravate the disorder by aiding the transformation of urea into ammonium carbonate. (Ringer.)

RHEUMATISM.—In acute rheumatism in plethoric persons with strong, acid perspiration, treatment with the alkalies gives most satisfactory results. If the system is alkalinized early in the disease, it is generally conceded that there is less danger of cardiac complications. The bicarbonate, citrate, acetate, or sal Rochelle may be given in doses of from 20 to 30 grains in cinnamon-water, well diluted, every three or four hours.

In chronic rheumatism iodide of potash, in 10-grain doses, given in compound syrup of sarsaparilla three times daily may be supplemented by alkaline baths made by dissolving 7 to 14 ounces of potassium bicarbonate in 30 gallons of hot water. The bath should be taken warm.

The alkalies are of great value in the uric-acid diathesis and in the various cutaneous affections said to be dependent upon it.

Diuretics.—In œdema, ascites, and

other serous effusions the diuretic effects of this group will be of great service. The acetate of potash may be given alone in doses of $\frac{1}{4}$ to 1 drachm, several times a day, or in a mixture similar to the following: Acetate of potash, 4 drachms; infusion of pilocarpus and compound spirit of juniper, of each, 2 ounces; of this a dessertspoonful, in a wineglassful of water, may be given every two hours in œdema with suppression of urine.

In functional inactivity of the liver the acetate of potash does good.

In lithæmia and in disorders of the urinary secretions the citrate or bitartrate may be used. A good combination is: bitartrate of potash (crystals), $\frac{1}{2}$ ounce; infusion of juniper, 1 pint; this amount to be taken in divided doses during the twenty-four hours.

In chronic Bright's disease the bitartrate and acetate are valuable; also in puerperal eclampsia.

In œdema of heart disease the bitartrate or acetate may be used in the form of the "Potus Imperialis": cream of tartar, $\frac{1}{2}$ ounce; water, 3 pints; sweeten and flavor with orange-peel.

The members of this group are useful in the treatment of uric-acid calculi. The best, perhaps, is the citrate, as it has the least tendency to derange the stomach when taken over a long period of time. We may give 5 grains each of the citrates of potash and lithia in Vichy water every four hours, as it is necessary in these cases to keep the urine continuously alkaline.

The citrate of potash is a valuable remedy in those cases of incontinence of urine which are due to a too-concentrated condition of the urine.

Purgatives.—The purgative salts of potash belong to that class of purgatives generally known as saline cathartics. Their activity depends upon their power

to increase intestinal secretion. Experiment has shown that the strength of the solution of a saline cathartic as it exists in the intestines within two hours after the administration of the salt is 5 or 6 per cent. If the salt has been given in greater dilution than this, water has been absorbed from it until this strength has been reached; if in greater concentration, the tissues have yielded their fluids to dilute it to the necessary degree. It then follows that if we wish to produce serous depletion, we should administer the salines in concentration; on the other hand, if we desire prompt action, they should be given in a solution of about 5-per-cent. strength. It is also a well-known fact that, if for any reason the saline fails to produce purgation, absorption of the salt takes place and a marked diuretic effect will follow. This explains why the members of this group are classed with the diuretics when they are administered in small doses.

The members of this group are useful in acute inflammations on account of their antiphlogistic action. In congestive and dropsical conditions and ascites the salines given in concentrated solution are hydragogues. In abdominal inflammations, as appendicitis and chronic peritonitis, they are antiphlogistic and depletive. In acute peritonitis they are useful in cases following surgical operations, but are contra-indicated by feebleness and by perforation or obstruction of the bowels.

In serous effusions, as pleurisy, the salines are given in the second stage to remove the effusion, and should be administered in concentrated solution. In abdominal hæmorrhage they are useful as hæmostatics, when given in concentrated solution, since by depletion they lower the blood-pressures. In hæmorrhages due to hepatic obstruction they are

particularly beneficial because of the depletive action on the portal circulation.

In plethora, if constipation is present, as it usually is, the daily use of salines before breakfast is to be recommended. Persons suffering from uric-acid diathesis with rheumatism or gout should use the salines by choice when laxatives or purgatives are needed, as they aid elimination and are antacid. A useful laxative where hæmorrhoids are present is the following: Cream of tartar, 1 ounce; washed sulphur, aromatic powder, of each, $\frac{1}{2}$ ounce; one teaspoonful of this may be made into a bolus with orange-syrup, and taken once or twice a day. In alcoholic cirrhosis cream of tartar in dose of $\frac{1}{2}$ to 1 ounce is an excellent hydragogic purgative. As an aperient, cream of tartar may be given in doses of from 1 to 2 drachms.

Sal Rochelle, or the tartrate of potash and soda, is an ideal saline laxative. It is most efficient when taken in the early morning when the stomach is empty; this is true of all salines. Sal Rochelle is the laxative agent in the Sedlitz powder, of which one is laxative and two are purgative.

The sulphate is a gentle cathartic, causing little pain, producing watery stools, and having some cholagogic action; it is said to act beneficially when suppression of the milk is desired, and is often given in fevers and after delivery as a laxative in doses of from 1 to 2 drachms. The acetate of potash may be given as a purgative in doses of from $\frac{1}{2}$ to 2 ounces.

Febrifuges.—The members of this group are useful in fevers and inflammations in that they lessen heat and promote excretion of the inflammatory products. The febrifugal salts of potash lessen the blood-pressure, the temperature, and the heart's action.

In the mild fevers, as measles and scarlet fever, the solution of the citrate of potash may be given in doses of 1 to 4 drachms every two hours. If preferred, an extemporaneous solution may be prepared as follows: Carbonate of potash (15 grains) is dissolved in $\frac{1}{2}$ ounce (tablespoonful) of water, and this solution added to 1 ounce (2 tablespoonfuls) of a mixture of equal parts of lemon-juice and water; this is given in a single dose, and should be freshly prepared each time. For convenience, a solution of the carbonate may be made up in quantity, each $\frac{1}{2}$ ounce of which contains 15 grains of the salt.

In acute rheumatism the nitrate of potash may be used as a febrifuge, 1 ounce of the salt being dissolved in 1 pint of barley-water or in the same quantity of syrup of gum arabic and water; a tablespoonful may be taken every three hours.

DISORDERS OF THE RESPIRATORY TRACT.—In pneumonia, nitrate of potash may be given, with great benefit, in small doses ($\frac{1}{4}$ grain), combined with $\frac{1}{12}$ to $\frac{1}{6}$ grain of Dover's powder every two or three hours.

In asthma relief is generally obtained by igniting small squares of bibulous paper previously dipped in a 20-per-cent. solution of nitrate of potash and dried (*charta potassii nitratis*), and inhaling the fumes.

The hoarseness of singers and speakers is relieved by 2 grains of the nitrate dissolved in a glass of sweetened water.

MALARIA.—In malarial intermittent fever the nitrate is especially valuable, if given in a single dose of from 15 to 24 grains in either the febrile or the non-febrile stage.

The nitrate is a reliable remedy in hæmoptysis with fever.

PURPURA.—In purpura simplex 10-

grain doses of the nitrate are useful; in purpura hæmorrhagica it may be given in doses of from 10 to 60 grains.

BURNS.—In the treatment of burns of all kinds potassium nitrate has been strongly recommended by Poggi (*Rev. Méd.*, Feb. 16, '96) as a topical application. (See BURNS.)

Alkaline Lotions.—Alkaline lotions are used with benefit in cutaneous and other disorders. A weak solution of the bicarbonate (1 drachm to 1 pint) has been used as an application to rheumatic joints, and in eczema in the early and middle stages when there is a copious weeping from a red and raw surface. Hebra advises the application of liquor potassæ or of a stronger solution of potash in the chronic forms of eczema. He brushes liquor potassæ, once a day, over the surface, and, if it produce much smarting, washes the residue off with cold water. When the skin is only slightly infiltrated and thickened he employs a solution of 2 grains of caustic potash to 1 ounce of water; but, if the infiltration is greater, he uses a solution containing from 5 to 30 grains or more to the ounce. These stronger applications must be employed only once a day and must be quickly washed off with cold water. This treatment speedily allays the itching, but is apt to make the skin brittle. To obviate this condition McCall Anderson applies, every night, either codliver-oil or glycerin. Anderson frequently employs alkalies in conjunction with tar or oil of cade, as in the following: Equal parts of soft soap, rectified spirit, and oil of cade; a little of this to be firmly rubbed over the eruption night and morning; it should be washed off before each reapplication.

SKIN DISEASES.—In eczema of the vulva Lusch advises the use of the following: Bicarbonate of potash, 1 drachm;

bicarbonate of soda, 2 drachms; glycerin, 1 $\frac{1}{2}$ drachms; laudanum, 2 drachms; water, 8 ounces; this is to be used as a lotion, night and morning.

In pruritus vulvæ, and in bites and stings, a solution of the bicarbonate (2 drachms to 1 pint of water) will give relief.

A weak solution of caustic potash or of the carbonate (1 drachm to 1 pint), applied with a small piece of sponge, is often of extreme comfort in urticaria or lichen. A solution of the same strength of the cyanide of potash, which has a strong alkaline reaction is, perhaps, better. (Ringer.)

GENITO-URINARY DISEASE.—In functional leucorrhœa, due to excessive secretion of the glands of the cervix uteri, the vaginal injection of a weak solution of the bicarbonate (1 drachm to 1 pint) will give relief; when the discharge is like the white of an egg or lumpy, three or four injections will often cure; but, when the discharge is yellow and puriform, these injections may fail, although, in many cases, when this yellow discharge is due to a mere abrasion of the os uteri, these injections, continued for a week or two, will change the yellow to a white discharge. (Ringer.)

Anti-emetics.—The citrate of potash is often serviceable as an anti-emetic in doses of from $\frac{1}{2}$ drachm to 4 drachms; the official liquor potassii citratis is often preferred in doses of from 1 to 8 drachms.

In the nausea and vomiting of the first stage of acute bronchitis and of febrile affections in general the use of the citrate in the form of "neutral mixture" (liquor potassii citratis) or effervescent draught will allay the trouble. Effervescent draught is composed of two solutions: a solution of bicarbonate of potash (2 $\frac{2}{3}$ ounces to 1 pint) and a solution of citric acid (2 ounces to 1 pint), the dose being

$\frac{1}{2}$ to 1 ounce of each solution, mixed when needed.

Potassium Chlorate.—Potassium chlorate is different from all the other salts of potassium, not only in its physiological action, but in its therapeutic effects. It is, perhaps, the most poisonous, with the exception of the cyanide. When locally applied to the mucous membranes its action is that of an irritant, and when absorbed into the blood it causes destructive changes in it (methæmoglobinæmia), and, if given in overdose, induces acute nephritis. It was formerly thought that chlorate of potash when taken into the system was decomposed and yielded a large amount of oxygen, but later experiments have shown that it passes from the body unchanged. It should never be triturated with sulphur, tannin, charcoal, or glycerin, as explosion is apt to follow.

STOMATITIS.—Chlorate of potash in solution (1 to 16) is used as a detergent mouth-wash and especially in mercurial salivation. The following solution is recommended for the latter use by Hare: Chlorate of potash, 48 grains; tincture of myrrh, $\frac{1}{2}$ drachm; elixir of calisaya, 3 ounces: of this mixture a teaspoonful may be taken every five hours, and may be used as a mouth-wash. In membranous or ulcerative sore mouth, in children, the same mixture or the plain solution (1 to 16) may be employed in smaller dose. In aphthæ the chlorate, finely powdered, alone or with powdered sugar, may be dusted on the patches. Dillon's antiseptic dentifrice contains chlorate of potash: Salol, chalk, charcoal, and powdered cinchona-bark, of each, 2 $\frac{1}{2}$ drachms; chlorate of potash, 1 ounce.

DISORDERS OF THE RESPIRATORY TRACT.—In diphtheritic and scarlatinal sore throat the chlorate in solution (1 to

16) may be applied with a swab or used as a gargle, but is not to be swallowed.

In diphtheria Waugh commends the following: Chlorate of potash, 1 drachm; hydrochloric acid, $1\frac{1}{2}$ drachms; mix and add tincture of the chloride of iron, 2 drachms; water, a sufficient quantity to make 4 ounces; of this a teaspoonful undiluted is given every two hours. When diluted with equal parts of water it makes an excellent gargle. Free chlorine is generated in this mixture.

In anginose sore throat H. C. Wood commends the following: Sumach-berries, 1 ounce; chlorate of potash, $\frac{1}{2}$ ounce; boiling water, 1 pint; allow to simmer for a few hours, then strain, cool, and use as a gargle several times during the day. The official troches may be used, allowing the troche to dissolve slowly on the tongue, but not too freely, lest poisonous symptoms should develop.

Chlorate of potassium should not be administered on an empty stomach, and the urine should be examined for met-hæmoglobin, which should guide the amount of salt ingested. Wohlgenuth (Med. Press and Circ., July 8, '91).

GENITO-URINARY DISEASES. — In inflammation of the bladder and rectum this drug has been used in solution as an injection. In acute rectal catarrh with mucous diarrhoea and tenesmus H. C. Wood advises the use of a solution (20 grains to 1 ounce) of chlorate of potash by rectal injection; not more than 4 ounces of the solution should be used at one time and that should be retained for twenty minutes. A cure will often result after one or two injections. In some cases it is well to add a saturated solution of the chlorate to an equal quantity of starch-water, as the latter aids in allaying the irritation. This is also useful in hæmorrhoids, especially if a few drops of laudanum are added (Hare).

SKIN DISEASES.—The irritant action

of the chlorate upon mucous membranes was utilized by P. D. Keyser in the treatment of epithelioma of the eyelid, who suggested daily applications of finely-powdered chlorate to the tumors, in many cases obviating the use of the knife.

Dumontpallier (Presse Méd., Mar. 18, '96) has used the chlorate in three cases of tumors of the gums and of the tongue. One patient had been operated on for epithelioma of the tongue and during convalescence a recurrent nodule appeared near the cicatrix. Applications of lunar caustic were made, but the nodule increased in size until in dimension and shape it resembled a large bean and was papillomatous in appearance. Local applications of the chlorate, in powder, were made six times daily, and $6\frac{2}{3}$ grains were given internally every four hours. In six weeks it was one-half the original size; three weeks later two small painless protuberances were visible, and two months later the growth had entirely disappeared. Continuance of treatment for two or three months is advised, and absolute assurance of the functional activity of the kidneys is necessary. The condition of the teeth, as a cause of irritation, should be ascertained.

The chlorate of potassium has been employed with more or less success in cutaneous disorders attended with suppuration. It has been found beneficial in the suppurative stage of sycosis, in pustular acne, in eczema pustulosa, and in the treatment of furuncles and carbuncles. Externally the chlorate has been found useful in powder or in saturated solution, as an application to unhealthy ulcers.

POTASSIUM CYANIDE. — Potassium cyanide has been used externally in solution (1 drachm to 1 pint) to allay paræsthesia, and as an application to the head to relieve reflex headache.

It is used internally ($\frac{1}{16}$ to $\frac{1}{4}$ grain) in mixtures to relieve cough, the effect being similar to that of hydrocyanic acid.

In nervous dyspepsia J. P. C. Griffith combines cyanide of potash with extract of valerian, given after each meal.

POTASSIUM AURO-CYANIDE.—Potassium auro-cyanide occurs in white crystals which are soluble in water. When injected hypodermically it is rapidly absorbed and does not precipitate albumin.

Behring's researches have shown that 1 part of this salt in 25,000 parts of blood-serum rendered the latter unsuitable as a medium for the growth of the anthrax bacillus.

POTASSIUM MERCURO-CYANIDE.—The allied mercurio-cyanide effects the same in a dilution of 1 to 60,000.

POTASSIUM CANTHARIDATE.—This substance occurs as a white, amorphous powder or in crystalline mass which is soluble in water. It has been used by Liebreich hypodermically in very attenuated solutions in the treatment of tuberculosis.

POTASSIUM COBALTO-NITRITE.—This salt occurs in yellow, microscopical crystals, which are slightly soluble in cold water and insoluble in alcohol and ether. It is used where the nitrites are indicated (dyspepsia, cardiac albuminuria, etc.), and is claimed to be more easily regulated in its physiological action than most nitrites. It is given in doses of $\frac{1}{2}$ grain, every two to four hours.

POTASSIUM DITHIOCARBONATE.—This salt results from the action of carbon disulphide on potash-lye at boiling temperature. It occurs in an orange-red, deliquescent crystalline powder, which is very soluble in water, and slightly soluble in alcohol. It is used in a 5- to 10-per-cent. ointment in the treatment of eczema, tinea tonsurans, and other cu-

taneous disorders. In a 20-per-cent. ointment it is used in psoriasis.

POTASSIUM OSMATE.—Potassium osmate, or perosmate, occurs in a violet-red crystalline powder, soluble in water. It is used in the dose of $\frac{1}{60}$ to $\frac{1}{4}$ grain in combination with the bromides against epilepsy, and hypodermically in neuralgia, goitre, etc., like perosmic acid.

POTASSIUM SOZOIODOLATE.—Potassium sozoiodolate (or potassium di-iodo-para-phenol-sulphonate) occurs as a glittering, white crystalline, powder, having a slightly-sour taste, soluble in hot water, and slightly soluble in cold water (1 to 70). It contains 52.8 per cent. iodine, 20 per cent. phenol, and 7 per cent. sulphur. It is antiseptic and bactericidal in its action. It is incompatible with mineral acids, ferric chloride, silver salts, etc. Strong sulphuric acid or heat drives off iodine-vapor. It is a substitute for iodoform. It is non-toxic, odorless, and soluble. Even when applied pure it does not irritate the skin; when the skin is inflamed it leads to a mild and reactionless exfoliation. It acts as a desiccant in powder or salve in concentration of from 1 to 10 to pure.

It is used externally in scabies, eczema, erysipelas, herpes tonsurans, impetigo, syphilitic ulcers, diphtheria, burns and scalds, ozæna, otitis and rhinitis, and as an injection for gonorrhœa. A 2 $\frac{1}{2}$ -per-cent. solution is sufficiently strong to kill *Acarus scabiei* in twenty-five minutes.

POTASSIUM TELLURATE.—This salt occurs in white crystals, soluble in water. It was introduced by Neusser and is used in doses of $\frac{1}{2}$ to $\frac{3}{4}$ grain in pill or alcoholic julep in the treatment of the night-sweats of phthisis. After one week it may be necessary to double the dose. No toxic symptoms follow its use. The appetite improves. During its administra-

tion the breath has a garlicky odor. This salt suppresses or diminishes the sweats, but does not influence the course of the disease.

C. SUMNER WITHERSTINE,
Philadelphia.

POTT'S DISEASE. See SPINE.

PREGNANCY, DISORDERS OF. (See also ABORTION.)

General Etiology.—Although pregnancy is a normal physiological condition and as such should be subject to no disorders except such as are purely accidental, it is but a truism to state that the variations from the normal are, in fact, most numerous and diverse. Penalties are these, for the most part, for the privilege of being civilized. Those who live in a state of Nature, as the wild animals live, are not, it is true, exempt from all disorders during the pregnant state; but the number of those who suffer is relatively smaller, and their sensitiveness to suffering is far less acute than is the case with women in civilized communities. Serious and even fatal disorders are of occasional occurrence among the savage and uncivilized, and they may also occur among animals.

The causes of disturbance during the pregnant state may be inherent in the individual at the inception of pregnancy, they may be due to pregnancy, or they may be the result of pregnancy *plus* other causes to which the individual may have contributed or which may be regarded in the light of accidents.

The following classification is submitted:—

I. Causes which are present when pregnancy is instituted:—

1. Faults of structure:—

(a) Structurally-defective pelvis.

(b) Defective uterus.

(c) Tumors in various parts of the body, especially in the pelvis or abdomen.

2. Faults of nutrition.

(a) Badly-nourished uterus.

(b) Local disease in any organ, or any disease which seriously modifies the general condition.

II. Causes which are due to pregnancy, the patient being apparently in normal condition at its inception.

1. Mechanical influences:—

(a) Pressure of the enlarged or displaced uterus upon contiguous structures.

(b) Disturbed circulation either from immediate pressure upon vascular structures or arrests of the current in its ordinary channel.

(c) Pressure upon the uterus by a new growth which has developed coincidentally with pregnancy.

2. Nervous reflexes, usually irritative in character.

3. Nutritive changes especially in the blood, nervous system, digestive apparatus, or secretions.

III. Causes which are due to pregnancy *plus* additional provocation from within or without the individual:—

1. Improper diet or habits.

2. Trauma.

3. Nervous and mental irritants.

4. Intercurrent disease.

5. Irritating conditions within the ovum.

I. CAUSES WHICH ARE PRESENT WHEN PREGNANCY IS INSTITUTED. — Of the causes of disorder in pregnancy which are present at the inception of the pregnant state there are, as before stated,

1. *Faults of Structure.*—(a) Structurally-defective pelvis. This may consist in the various deformities—pelvis too large, pelvis too small, or pelvis of irregular contour—which interfere with the proper and symmetrical development

and enlargement of the uterus and the ovum which it contains.

This interference in the development of the uterus may lead to abortion; may produce pain, nausea, and vomiting; faults of digestion, constipation, interference with the pelvic circulation, and a variety of distressing phenomena during pregnancy, as well as difficulty during parturition. The pelvis may also be the seat of serious disease (*e.g.*, osteomalacia), weakening its structure and rendering it unfit as a support for the body and incidentally for the pregnant uterus.

(b) Defective uterus. This may consist in a faulty position or in imperfections of structure which may properly be attributed to bad nutrition. The displaced uterus—whether the displacement be anterior, lateral, or posterior—is certainly a defective uterus for any purpose and in any situation, and it becomes the more strikingly so when it has been impregnated. Normal development is hindered, the circulation becomes impaired, pain and discomfort give annoyance, and unless the displacement is corrected uterine contractions may be provoked and the contents of the uterus expelled. Correction may be and often is spontaneous, but is not always a result, especially if the displacement is a posterior one. The diagnosis is almost always susceptible of determination by means of a careful bimanual examination, and successful treatment is usually possible unless the uterus is fixed by adhesions in its faulty position.

(c) Tumors in various parts of the body, especially in the pelvis or abdomen. A tumor in any part of the body, especially if of a malignant character, may so impair the general condition as to militate against the successful continuance of pregnancy. This is notably

the case, in addition to malignant disease, with the tumors which develop in connection with tuberculosis, syphilis, and other constitutional diseases. With the tumors of the pelvis and abdomen, whatever their character, it is easy to see that, by their very presence, by their encroachment upon the space required by the uterus as it enlarges, they may be an efficient cause of pain, of disturbance in the circulation, of digestive disorders, etc., and if they do not compel the uterus to throw off its contents they may so complicate the situation that parturition will become not only difficult, but positively dangerous. Indeed, successful delivery by the ordinary method and measures may be quite impossible, and removal of the tumor may be required before the uterine contents can be removed.

2. *Faults of Nutrition.*—(a) Badly-nourished uterus. The uterus which thus becomes a source of disturbance during pregnancy may be congenitally defective, or its defects may be the result of disease, bad habits, or traumatism. The entire organ may be rudimentary and poorly developed, or the difficulty may be limited to the muscular structure or to the endometrium. Arrest of development during foetal life from causes which are not always traceable is not particularly rare. Arrest of development from the diseases common to childhood or from constitutional disease (syphilis, tuberculosis, etc.) is also not infrequent. Traumatism, as from rape, from the forcible thrusting of sticks or other hard substances into the vagina, from burns, and from caustic substances is of less frequent occurrence.

In any of these cases pregnancy comes to an organ ill prepared to perform its function, and it does not respond to the demands which are made upon it. We should not be surprised that pain and

discomfort accompany such a pregnancy, and that its termination should be an abortion in the early months.

Another class of cases is that in which the uterus is defective from growths within its structure, especially fibroid growths. Whether these are located within the muscular structure, upon the peritoneum, or within the uterine canal, they are always a menace to pregnancy, and frequently are an efficient cause in producing its premature termination. While the disorders which attend this class of cases consist principally in disturbance which affects chiefly the uterus itself and its immediate surroundings, it not infrequently happens that systemic infection is added, and the final result may be a disastrous one for the patient.

(b) Local disease in any organ, or any disease which seriously modifies the general condition. Aside from disease in the uterus itself antedating pregnancy, there may be disease in the tubes or ovaries or both which may give rise to much trouble. Simple inflammatory conditions of these organs or distinctly-infectious disease, acute or subacute, may excite much discomfort and perhaps lead to serious results.

Disease of the liver, kidneys, heart, or lungs may antedate pregnancy and may suffer exacerbation as pregnancy advances.

The disturbance may be sufficient to provoke abortion or the patient may go to term in spite of the concurrent disease. Death during parturition is not uncommon with those who suffer with such disease. In other cases the patients recover a moderate degree of health after a prolonged and severe puerperium.

Twenty cases of pregnancy complicated by cardiac disease noted and following conclusions reached: Women with heart disease conceive as often and

as easily as healthy women, but gestation is more apt to end in abortion. Pregnancy generally aggravates the cardiac trouble, either temporarily or permanently, and under certain circumstances is attended with great danger. The causes which may determine death are pulmonary oedema and syncope by arrest of the heart's action, sometimes immediately after labor and sometimes several weeks later. The physician should, therefore, oppose the marriage of women suffering from heart disease, and advise abstinence in those already married. When serious cardiac symptoms arise in the course of gestation, which cannot be controlled by ordinary measures, the pregnancy should be arrested by artificial means. This indication is especially urgent when there is dyspnoea, oedema, or weakness of the heart. The results of induced abortion in such cases are more satisfactory than formerly. Chloroform may be used if the degree of prostration is not too pronounced. These conclusions are also applicable to cases of pulmonary tuberculosis, which is always aggravated by pregnancy. Leyden (*Zeit. f. klin. Med.*, Nos. 1 and 2, '93).

Early stages of valvular disease do not seriously complicate pregnancy, which, on the other hand, does not aggravate the heart affection. Twenty-nine cases showed mitral incompetence in 6 cases, mitral obstruction, 11; mitral incompetence with obstruction, 7; aortic incompetence, 1; complex (aortic and mitral) lesions in 3. Out of 29 cases of pregnancy involved, no further mischief in 18. In 2 patients influenza occurred, yet both were delivered at term. One patient had symptoms of melancholia and was delivered prematurely. In 4 there was marked oedema of the legs. Nearly all the 29 had varicose veins. In only 4 was the complication serious, yet all recovered. In only 8 of the whole 29 cases was labor premature; 2 of the 8 were twin pregnancies. Vinay (*Centralb. f. Chir.*, Nov., '93).

Cases of pregnancy in which the cardiac symptoms are slight, as a rule, have a favorable issue, but if the cardiac symptoms are marked, and have a

tendency to increase, it is questionable how far the expectant treatment is justifiable. Thirty-five or 40 per cent. of cases with serious complications are fatal.

Expectation of life in children born of women with serious heart-lesions is much impaired; so that too much consideration for the life of the child, without benefit to either, probably has been given.

Of 7 cases of women collectively pregnant 31 times. Of the 15 children born before the cardiac symptoms became so severe as to require advice, 12 are alive and 3 are dead. In the 16 other pregnancies, in which the cardiac symptoms were marked, all but 3 are dead and 1 of the 3 surviving has but a few months to live. George Sears (*Amer. Medico-Surg. Bull.*, Apr. 15, '95).

Influence of pregnancy on 62 women who were the subjects of mitral stenosis. Of these 23 died, either in the course of pregnancy, in parturition, or within three weeks after delivery. The most fatal period for such women is just after delivery; 14 of the 23 died between sixteen and twenty-two days after the birth of the child, 2 died in labor, and 7 before parturition set in. Abortion or premature labor was not infrequent.

Hæmorrhages from the lungs and uterus are pretty common, but are to be regarded in a favorable light, for they occurred in only 8 of the 23 fatal cases, whereas they happened in 18 of the cases that ran a favorable course. Anasarca, albuminuria, and convulsions are not constant. H. B. Allyn (*Glasgow Med. Jour.*, Oct., '95).

In pregnancy with cardiac disease sole thought should not be given to heart; by watching and treating the kidneys, the skin, the intestines and the lungs, the state of the heart may be relieved, asphyxia and intoxication be prevented, and time gained. Artificial labor is rarely indicated in a pregnant woman in whom the cardiac symptoms have ended or are about to end in asystole. Venesection acts more favorably and rapidly, aided by oxygen to stimulate the lungs, milk for the kidneys, purgatives, and intestinal disinfectants. Ri-

vière (*Gaz. Hebdom. des Sci. Méd. de Bordeaux*, June 30, '95).

Literature of '96-'97-'98-'99.

Conclusions regarding heart in relation to pregnancy, parturition, and puerperal state: 1. Fact of hypertrophy of the left ventricle occurring in normal pregnancy should be accepted as proved. In delicate and feebly-developed subjects it may sometimes be absent, and in these cases signs and symptoms of cardiac insufficiency are likely to occur. 2. A certain amount of dilatation of all the chambers of the heart does normally occur in pregnancy. 3. Failure of the ventricle has a distinct effect upon the course of pregnancy. In the early months it leads to abortion, and in the later months to premature delivery. 4. The heart during pregnancy and the puerperium is specially liable to undergo fatty degeneration. 5. The condition of the muscular heart-wall is of more importance during pregnancy than the valvular lesion; many women with valvular lesions pass through their early pregnancies without any sign of heart-failure, but as the heart-muscles become deteriorated by the strain of repeated pregnancies they show increasing evidence of cardiac insufficiency. 6. Of all the forms of valvular lesion, mitral stenosis of a marked degree is the most disastrous. M. Handfield-Jones (*Lancet*, Feb. 1, '96).

Different forms of cardiac lesions during and after pregnancy to be apprehended are: 1. Adherences due to an old pericarditis, or displacement of the heart from pleural adherences. 2. Myocarditis and degeneration of the cardiac muscle. 3. Endocarditis affecting the valves. 4. Endocarditis in an acute form, grafted on a chronic form. During pregnancy, if there is no symptom of cardiac insufficiency, it is enough to forbid going upstairs, and to keep the digestive functions in good order. Disorders indicating that the lesion is no longer compensated, do not appear before the fifth month, after which the patient must be kept in a reclining position. Arsenic, iron, and strychnine will combat the weakness of the heart; ether and am-

monia in case of syncope. If there is œdema and dyspnoea, digitalis and strophanthus can be given, even in cases of aortic lesion. Phillips (*Revue des Mal. des Femmes*, Jan., '96).

To relieve symptoms of the disturbed heart's action in pregnancy every exertion must be interdicted, and the patient should remain in the recumbent posture the greater part of the day. Frequent examination of the urine is indispensable. A strict milk diet must follow the finding of the first trace of albumin. Cardiac stimulants are indicated. If this mode of treatment is not followed by an amelioration of symptoms and the cardiac incompetency increases in spite of efforts, question of the propriety of terminating pregnancy may justly arise. Success can only be expected if the pregnancy is terminated *before* the onset of serious symptoms. Julius Rosenberg (*N. Y. Med. Jour.*, Jan. 18, '96).

It is necessary to interrupt pregnancy in cases of heart disease only in those patients in whom there is a disturbance of compensation. In all other instances satisfactory results will follow close care during the latter months of pregnancy and labor, as well as in the puerperium. If heart disease be discovered during gestation a milk diet, constant rest before and after labor, and heart-tonics will generally suffice. In mitral disease heart-failure is most apt to occur during the second stage of labor. In aortic disease the most dangerous period is immediately after labor. Luoff (*Annales de Gynéc.*, Dec., '97).

There are four indications for prophylaxis in regard to the kidney in pregnancy: 1. The urine of all pregnant women should be regularly examined especially after the sixth month. Examination of the urine should be chemically for albumin, sugar, and total solids, and microscopically for casts. It is of the most importance to obtain an approximate idea, at least, regarding the amount of urea excreted in twenty-four hours. 2. The formation of toxins is best prevented by careful regulation of diet and by an abundance of pure air. Pregnant women should not eat too much meat, and that

only once a day. Lamb, mutton, fish, and oysters are best for them, with raw or cooked fruit, and with the lighter fresh vegetables in moderation. Graham or whole wheat bread and all cereals are also helpful. Spirits should be interdicted during pregnancy. 3. The gravid uterus makes quite enough pressure upon the kidney without the added weight of heavy skirts, tight bands, and a laced-in corset. The clothing should be light and suspended from the shoulders. All of the limbs should be protected by flannel undergarments, except in the hottest weather. Multiparæ are often helped by a bandage. 4. To promote excretion by the skin, frequent baths are necessary. A proper evacuation of the bowels is the most important duty that the future mother has to perform. Casarea sagrada, either as fluid extract or as the aromatic trade preparation, daily doses of compound-licorice powder, sulphur and cream of tartar, saline mineral waters, small doses of colocynth and podophyllum are all useful. A glass of milk in the morning purges some patients, though it constipates others. If there be beginning signs of renal incompetency, saline diuretics, spiritus ætheris co., infusion of digitalis, if the arterial tension be not too high, will be found useful in increasing kidney secretion. Large quantities of fluid—such as alkaline mineral waters, milk, bitter vegetable infusions, or even of ordinary water—will prove of service. Mercuric chloride—to increase the flow of urine, to diminish the œdema, and to improve nutrition—should be given for a long time in doses of at least $\frac{1}{40}$ grain three times a day.

In this manner 80 per cent. of the patients who are in danger from renal failure and faulty metabolism may be tided over until they are safely delivered. James L. Kortright (*Brooklyn Med. Jour.*, Apr., '99).

Constitutional disease at the inception of pregnancy may also be a very troublesome disturbance to that condition. This may consist in syphilis, tuberculosis, profound anæmia, or any wasting or in-

tensely infectious disease which in itself is a severe drain upon the vital forces. Pregnancy is often interrupted under such conditions.

If it should continue to term the child may be dead at birth or so poorly nourished that death may occur without a very prolonged struggle.

II. CAUSES WHICH ARE DUE TO THE EXISTENCE OF PREGNANCY, THE PATIENT BEING APPARENTLY IN NORMAL CONDITION AT ITS INCEPTION.

1. *Mechanical Influences*.—These are among the most common of the causes which disturb pregnancy. They are usually traceable without great difficulty, and in some cases are susceptible of removal. In the greater number of cases, however, they persist as long as pregnancy persists.

(a) Pressure of the enlarged or displaced uterus upon contiguous structures. The conditions relating to the displaced uterus have been described. It is not until after the first half of pregnancy, as a rule, that the pressure of the uterus causes disturbance. One of the most common results of such pressure is disorder in the urinary function. Without discussing the various theories concerning the albuminuria of pregnancy it is quite evident that pressure is one of the causes, for the albuminuria usually ceases when pregnancy is terminated. When one realizes the susceptibility of the kidneys to floating and wandering it is not strange that they should occasionally get in the way of the enlarging uterus even when it is progressing in a perfectly normal manner. (See PARTURITION.)

Pressure of the enlarged uterus is also responsible for various other disorders. Pressure upon the intestines may cause obstruction in those viscera, and it often happens that the constipation which may

be so troublesome during pregnancy is traceable to such a cause, especially when the pressure is directed upon the rectum.

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Pregnancy plays no part as an etiological factor in the causation of appendicitis. The influence of appendicitis on pregnancy is, on the other hand, well marked. In 7 out of 22 cases abortion at about the fourth month resulted, either before or after surgical treatment.

The mortality in the 22 cases was: Maternal, 30.4 per cent.; fetal, 47.8 per cent.; consequently pregnancy renders the prognosis of appendicitis more serious. Treatment is that of appendicitis, the pregnancy not constituting a contraindication. Early intervention is desirable. Bouillier (Thèse de Lyon, '97).

Pressure upon the stomach may cause more or less of the indigestion and gastric discomfort of the later months of pregnancy.

Pressure upon the liver, the gall-bladder, or the bile-ducts may account for jaundice, for nausea, and vomiting. Pressure upon the diaphragm causes some of the discomfort of the latter part of pregnancy, the difficulty in respiration, and sometimes the irregularity of action which is manifested by the heart.

Pressure upon the bladder gives rise to much discomfort in not a few cases. The uterus may so rest upon this viscus that it cannot distend symmetrically as the urine enters it. This may cause such a condition of irritability that there will be a constant desire to micturate. Inability to empty the bladder completely often leads to decomposition of the residual urine, with resulting cystitis, which may persist long after pregnancy has ended. Disorders of the bladder are among the most annoying troubles from which pregnant women suffer. The results of the pressure of the enlarged uterus upon nerves and ganglia are not

often sufficiently pronounced to excite attention. It is, of course, possible that the sacral nerves and the ganglia of the pelvis may be so encroached upon as to cause numbness or even paralysis of the lower extremities, on the one hand, and interference with the nutrition of the pelvic and abdominal viscera, on the other. The former condition has been observed by most obstetricians of experience in more or fewer cases, but I am not aware of any observations which have been made in regard to the latter.

(b) Disturbed circulation, either from immediate pressure upon vascular structures or arrest of the current in its ordinary channel.

The two primary conditions which may result from this factor are anæmia and congestion. Anæmia is experienced, of course, in the tissues which are immediately compressed. Such a result is usually transient, since the uterus does not normally exert its pressure over the same area for a very long time. It must change its position and the direction of pressure as it enlarges and emerges from the narrow limits of the pelvis to the less restricted abdomen. If, however, it becomes agglutinated to any of the structures with which it is brought in contact, that structure may suffer, not only with anæmia, but with the more serious effects of malnutrition which follow as a consequence. Anæmia of the compressed portion is not, of necessity, attended with congestion of the contiguous portions, for the anastomosing circulation may be so perfect that the blood-current will adapt itself to the new and changed conditions. Such a fortunate result does not always occur; hence the frequent manifestation of congestions in various parts of the body in response to the obstruction which has been placed in the customary channel for the blood.

The veins of the vulva and legs furnish the most vivid illustrations of these obstructive conditions. They are frequently enlarged to an enormous size, and their rupture, especially those of the vulva, during parturition may be attended with the most serious consequences.

(c) Pressure upon the uterus by a new growth which has developed coincidentally with pregnancy. This complication is, of course, an unusual one. Pregnancy may incite abnormal activity in growths which were previously quiescent or not troublesome, or the first intimation of their presence may come with the obstruction which they cause during pregnancy. Ovarian cysts and fibroid tumors of the uterus furnish familiar examples of this form of obstruction. Less frequently seen are bony tumors of the pelvis, malignant growths of the pelvis and abdomen, and ascitic accumulations, with tuberculosis and with disease of the liver, spleen, and kidneys.

From one hundred and thirty-five cases, in literature, of ovariectomy performed during pregnancy following conclusions are drawn: (1) complication of pregnancy with ovarian tumor is to be considered a very grave occurrence, in which, with few exceptions, extirpation of the tumor comes into question; (2) the further pregnancy progresses, the more dangerous is the situation; (3) the puncture of ovarian cysts and the production of abortion are to be considered only in an emergency; (4) ovariectomy gives the best results for the mother in the second, third, and fourth months of pregnancy, for the product of conception in the third and fourth; (5) if an early ovariectomy is not possible for various reasons, it is to be carried out in the later months of pregnancy, as good results can be even then expected. D. Sirne (*Archiv f. Gyn.*, B. 24, H. 3, '92).

Ovariectomy strongly advocated during pregnancy. In 150 ovariectomies personally performed, 5 were done during pregnancy and 11 very soon after the

puerperium. Of the 5 pregnant cases, 1 died of shock; but suppurative peritonitis following suppuration of the cyst and tension of the pedicle had set in before operation. In the other 4 little or no difficulty was encountered.

Out of the 11 cases of ovariectomy shortly after delivery, 2 died, in both cases from acute suppuration of the cyst. In all the 11 there were dangerous or troublesome complications. In all 150 cases suppuration of the cyst was only seen in 16. In half of these cases the complication was due to childbirth. Hence, ovariectomy in pregnancy is less dangerous than expectant treatment and operation deferred till after delivery. The operation should be performed directly the tumor is diagnosed, preferably in the course of the first five months. Mangiagalli (Berliner klin. Woch., May 21, '94).

In ovarian tumors complicating pregnancy statistics show that pregnancy is interrupted in about one-third of the cases operated on, and therefore in the interest of the child it is better to wait as long as possible; nevertheless the tumors should be removed as soon as may be in case of pregnancy, especially if adherent. Staube (Monats. f. Geburts. u. Gyn., Oct. 4, '95).

Scarcely one-fifth of all cases complicated by fibroids terminate without surgical interference, and about one-third of the mothers and one-half of the children die during or soon after delivery in consequence of the morbid growths. Operations during early pregnancy give better results than those undertaken later, and enucleation *per vaginam* should be elected when possible. Sutugin (Wratch, Jan., '91).

It is but seldom, notwithstanding their great frequency among child-bearing women, that fibroid tumors give rise to any inconvenience during pregnancy, and very rarely do they require surgical interference. Halliday Croom (Edinburgh Med. Jour., Oct., '92).

Following conclusions reached regarding treatment of cancer of gravid uterus:

1. During the first three months vaginal hysterectomy is the operation of choice.
2. When the fœtus is viable (seven and

one-half months) the Cæsarean operation, immediately followed by total extirpation of the uterus and appendages, meets all the requirements. 3. Between four months and seven and one-half months, total abdominal hysterectomy should be practiced without delay. Hernandez (Annales de Gynéc. et d'Obstet., Aug., '94).

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In pregnancy ovariectomy should be performed during the first months whenever possible. The question of inducing premature labor is to be entertained when the tumor appears to be very closely adherent or intraligamentous, so that ovariectomy would be of considerable gravity. Tapping must not be practiced. Hohl (Archiv f. Gyn., vii, pt. 2, '96).

Six personal cases of fibroids complicating pregnancy, and not one resulted in serious complications. All the mothers lived, and five of the children. Therefore, with few exceptions, myomatous tumors of the uterus had better be let alone until the commencement of labor. Julius Rosenberg (Med. Rec., Mar. 7, '96).

One hundred and sixty-six cases of carcinoma of the pregnant uterus collected since 1886. Conclusions as to best methods of treatment are: In cases of early pregnancy, when the disease has not yet extended beyond the cervix, vaginal hysterectomy should be performed at once; but if pregnancy is too far advanced to permit of extirpation by vaginal route, it is better to perform Freund's operation. Statistics show that vaginal hysterectomy, when performed in the early weeks of puerperium, does not appear to be attended with any additional risks. At full term Cæsarean section followed by total extirpation is the ideal operation if the fœtus cannot be born through the natural passages; but if there is any extension of growth into the parametric tissue, the Cæsarean section alone should be done. G. H. Noble (Amer. Jour. of Obstet., June, '96).

Case in which a triplet pregnancy was complicated by the presence of multiple

fibroids of the uterus. The patient was a primipara, aged 36, and pregnant about three months. The abdomen, however, was as large as at full term, and was rapidly increasing, and the woman's condition was precarious, so it was decided to open the abdomen. Uterus was found to be studded all over with interstitial and subserous myomata, and it was only after the whole mass had been removed by hysterectomy, and the uterine cavity laid open, that it was discovered that inside it were three fœtuses in two bags of membranes. Age was three months. Patient made a good recovery. W. Jepson (Amer. Gynæc. and Obstet. Jour., Aug., '97).

Hysterectomy in fibroid uteri in pregnant patients is demanded for four indications: (1) when, independently of pregnancy, the fibroid tumor would make hysterectomy justifiable; (2) when the fibroid occupies such a position that labor would be impossible; (3) when the tumor is degenerating or suppurating, and when a retained placenta complicates the case; (4) hysterectomy should be performed in a case of labor complicated by fibroid tumor of the uterus after the child has been extracted by Cæsarean section. Keiffer (Gaz. Hebdom., No. 34, '97).

1. Solid neoplasms of the ovary complicating pregnancy are exceedingly rare.

2. The diagnosis may be difficult. In certain cases it may be aided by recto-abdominal palpation under narcosis, using Kelly's method to gently produce artificial descensus of the uterus. The physical examination with the signs of pregnancy, and those which belong more particularly to solid ovarian growths, generally enable us to make a probable diagnosis and one sufficient to warrant an exploratory section.

3. The prognosis in case of solid growths of the ovary complicating pregnancy is much worse, both for the mother and child, than in those of cystic neoplasms of these organs. Abdominal section and extirpation of solid tumors during the early months of pregnancy produce equally good results, so far as the fœtus is concerned, as in case of cysts. The result to the mother depends

on the malignant or benignant nature of the growth.

4. In extirpation during the second and fourth months of gestation the maternal mortality is but 5 per cent., due to hæmorrhage, shock, sepsis, etc., whereas the fœtal mortality due to abortion is only 20 to 22 per cent., as compared with 40 per cent. for the former, and 80 per cent. for the latter, when those cases are left to unaided Nature.

5. The compulsory operation (during the latter part of gestation, during labor, or the puerperium) will rarely be required. Swan (Bull. Johns Hopkins Hosp., Mar., '98).

2. *Nervous Reflexes*.—It would be difficult to refer to all the possible disorders of this character. The nerve-connections of the uterus with other parts of the body, especially with the abdominal viscera, are so numerous that there is a certain degree of reasonableness in attributing a great variety of nervous disturbances to a cause within the uterus. A woman with highly-developed nervous system may be peculiarly sensitive to irritation when the uterus is in an exalted state of functional activity, and thus we may explain many of the peculiar phenomena of pregnancy. Perhaps the most common of these phenomena are the nausea and vomiting: the "morning sickness" of pregnancy. Others which are less noteworthy are neuralgias in various parts of the body, peculiar conditions of the special senses, disturbances of digestion, secretion, etc. The nexus between these conditions and pregnancy seems to be demonstrated in the fact that with the termination of pregnancy the conditions in question disappear also.

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Forty-nine cases of peripheral neuritis in pregnancy and the puerperal state collected. The disease is more common in multiparæ. One-fourth of the cases occurred during pregnancy, while

in one-third there was a history of some form of sepsis. In 11 cases marked and incessant vomiting was present. It was not possible to trace a connection with alcoholism, and sepsis and continual vomiting are the most potent causes. The disease began in the legs, then extended to the arms. The muscles were wasted and there were disturbances of sensation. In 14 cases there was either no recovery or but partial cure. In 22 cases recovery was complete, while in 13 no mention was made of the termination. Reynolds (Brit. Med. Jour., No. 1920, '97).

Unlike hysteria and epilepsy, chorea constitutes a serious complication of pregnancy; the mortality has been variously estimated from 30 to 28 per cent.; sudden death has been reported among such patients. In fatal cases death ensues from asphyxiation, the patients becoming paralyzed and often maniacal. In 20 per cent. abortion happens, or premature labor. Many of these women were rheumatic or chlorotic before pregnancy. Tarnier (La Presse Méd., No. 29, '97).

3. *Nutritive changes*, especially in the blood, nervous system, digestive apparatus, and secretions. Pregnancy is certainly the expression of a physiological requirement in animal nature. Normally it should be attended by no unusual phenomena; but unfortunately the absolutely normal type of pregnancy is seldom seen. The variations in connection with the nutritive functions are especially pronounced. In a general way it may be said that exaltation is the characteristic in one class of cases and depression in another.

With the former the improved condition of the tissues shows the comparative gain in volume and nutritive value of the blood; the mind and nervous system, which may have been in a condition of irritation, are now so calm and equable that the change becomes noteworthy to those who are familiar with the state

of affairs prior to impregnation. The digestion is improved, the secretions by their abundance show the activity of the entire glandular apparatus; in a word, pregnancy has acted as a stimulant and tonic, and such women frequently declare that they have never felt better in their lives than when pregnant. This is the exaltation which may be coincident with pregnancy. In the other class the very opposite is seen: anæmia becomes more and more marked as pregnancy advances, nervous and mental irritability and depression are more or less constant, melancholia and mania being not infrequent; digestion is constantly disturbed, nothing seems to be well assimilated, nausea and vomiting cause great annoyance, and the secretions are deficient in quantity and impaired in effectiveness. This is the depression which may also be the accompaniment of pregnancy.

III. CAUSES WHICH ARE DUE TO PREGNANCY PLUS ADDITIONAL PROVOCATION FROM WITHIN OR WITHOUT THE INDIVIDUAL.

1. *Improper Diet or Habits*.—There are few subjects about which even intelligent people err more grievously than as to their diet and their ordinary habits. The selection of suitable food is at all times a subject of the first importance, and when those who suffer with the ills of pregnancy suffer also from the use of improper food, whether this be the result of necessity, or of ignorance, or of willfulness, the consequences are pitiable, for Nature is no respecter of persons. The sufferings in these cases are primarily, of course, related to the digestive apparatus, indigestion, constipation, nausea and vomiting, and loss of appetite being most conspicuous; but other portions of the economy may become involved, until confusion and anarchy pre-

vail. The influence of improper habits in accentuating the disorders of pregnancy is a fact which is continually presenting itself. It is only necessary to mention in this category the unfavorable influence of overwork, insufficient sleep, the excitement of life in society, alcoholic excesses, and frequent coitus, to illustrate the possibilities of disturbance which may occur, and which in very many cases are entirely unnecessary and avoidable.

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Many complications accompanying and following pregnancy are due to errors in diet. The pregnant woman should avoid excesses of water and albumin. Following diet prescribed based upon 25 observations: Fresh meat once daily in small quantity. Green vegetables, salad, potatoes, bread, and butter. Eggs, pease, and beans to be avoided as much as possible. Wine, beer, and alcohol are forbidden, and only enough liquids should be taken to allay thirst. Advantages are:—

1. Activity is preserved up to time of delivery; sensations of fullness, fatigue, thirst, and constipation disappear early.

2. Rapidity and facility of delivery even in cases in which previously it had been difficult.

3. A limited quantity of amniotic fluid.

4. Possibility of nursing offspring, the milk being of good quality and quantity.

The medium weight of the children was six pounds, and the circumference of the head thirty-three to thirty-four centimetres. Eichholz (*Revue Méd.*, May 16, '96).

2. *Trauma*.—Injuries of various characters are not inhibited nor prevented by pregnancy. Some of them may be considered mere curiosities; for example, the tearing open of the pregnant womb by the horns of cattle, early delivery by Cæsarean section because of extensive pelvic deformity, kicks in the abdomen

and other brutal treatment, penetration of the vagina and uterus by sticks or other hard objects, accidentally or intentionally. All these causes may produce intense disturbance: the delivery of the ovum, pain and inflammation, sepsis, and even death.

3. *Nervous and Mental Irritants*.—

There are many causes of this nature which produce disturbance of one kind and another during the pregnant state. Sudden emotions of fear, surprise, grief, anger, etc., may produce unusual results, owing to the extreme sensitiveness which many women experience while pregnant. With one woman the result will be a general sense of pain or a neuralgia in some particular nerve or set of nerves. With another the result will be nausea with or without vomiting, with another diarrhoea, while with others the uterus will be excited to contraction and its contents expelled. A very common result from such excitants is incontinence of urine, the urine being voided involuntarily with the slightest nervous or mental impression of an unusual character. The birthmarks or stigmata with which many children come into the world are often traceable only to mental impressions or a disordered imagination, and many of the monstrosities among infants may be fairly accounted for in this way. A woman whose mind is diseased may produce a persistent impression upon her unborn child which will manifest itself at a later period upon the child's physical or mental structure. Women with organic disease of the nervous system may so impress their offspring that they will succumb during the gestation period, or if carried to term will be of such defective structure that their entire lives will be burdensome to them.

4. *Intercurrent Disease*.—Of this form of irritant the eruptive fevers furnish a

familiar example. Any acute disease developing during pregnancy may not only be of a more severe type than would ordinarily occur, thus intensifying the patient's discomfort and suffering, but it may even cause the death of the child or its premature delivery, either alive or dead.

In closely observing 432 cases of small-pox in women under 50 years, particular note made of 80 who were pregnant. Of these 15 per cent. died, while the mortality of the non-pregnant cases was 11.08 per cent.

Pregnancy increases the predisposition of a patient to the graver forms of variola. In the 80 cases, confluent small-pox was seen in 4 and hæmorrhagic in 6 cases; all the 10 died. In the 352 non-pregnant cases the confluent form was observed in 3 and the hæmorrhagic in 11 patients; 2 of the confluent cases recovered. Two pregnant women died of milder forms; of the total, 12, there died 5 undelivered, the most of the others very shortly after birth without any trace of puerperal infection. Of the primiparæ, 9 per cent. died; of the multiparæ, 17.25 per cent.; 6.25 per cent. of women attacked by small-pox early in pregnancy died, while the mortality of those who were infected later amounted to 20.83 per cent. Abortion or premature delivery was noted in 23 of the 80 cases during the course of the attack of small-pox. In 6 the same took place after convalescence from the disease; 16 children were delivered alive in cases where the small-pox was still in progress, 8 at term, and 8 prematurely; only 3 lived longer than six months. Several died of variola; 2 were clearly born with it. Van der Willigen (*Nederland. Tydschr. voor Geneesk.*, No. 11, '95).

Hypothesis that the occurrence of tetany during pregnancy depends primarily upon some abnormality in the function of the thyroid gland, and it is the unusual demands made upon this organ in the later months of pregnancy which make this such a favorable time for the occurrence of the attacks.

Opinion entertained that it is prob-

able that tetany occurring under other conditions will in most cases be found to be due to an insufficiency, absolute or relative, in the action of the thyroid gland or like structures. H. M. Thomas (*Johns Hopkins Hosp. Bull.*, May, June, '95).

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In last epidemic of influenza numerous cases of metritis or metroperitonitis in the last months of pregnancy were recorded. Severe hypogastric pain set in, and proved very obstinate. It became complicated within a few days or weeks with phenomena of delivery and child-bed, and often proved serious in consequence. Usually the complication passed off with an attack of herpes labialis or urticaria. Coughing was frequent, and increased the local condition; fever was never high. Quinine, morphine, rest in bed, and very careful watching during convalescence usually effected a cure. Hennig (*Centralb. f. Gyn.*, No. 6, '96).

Influenza is generally mild in the pregnant woman. If, however, the attack is severe, pregnancy is always interrupted. Hintze (*Centralb. f. Gyn.*, p. 1311, '96).

5. *Irritating Conditions Associated with the Ovum.*—Such conditions may consist in disease which has been transmitted from the mother (*e.g.*, syphilis), or there may be diseased conditions of the placenta or membranes which may react upon the mother. Especially if death of the ovum takes place and it then remains within the mother's body it may be a source of disturbance to her. One of the most distressing illustrations of such possibilities is the wide range of untoward phenomena which are connected with ectopic gestation. There is perhaps no accident to which a pregnant woman is susceptible which brings with it such terrible consequences as this. That some women escape the serious results which so often happen when this condition is undiscovered and untreated by the surgeon's art is no contradiction to the truth of this assertion.

Disorders of Pregnancy.

Certain salient conditions are frequently conspicuous and troublesome in connection with the pregnant state. These conditions will be considered under the following category: Nausea and vomiting. Ptyalism. Displacements of the uterus. Embolism and thrombosis. Ectopic gestation. Pruritus vulvæ. (Edema of the external genitals. (Edema of the lower extremities. (Edema of the upper extremities. Hæmorrhoids. Uterine pain, or cramps. Spurious pregnancy. Concealed pregnancy.

Nausea and Vomiting.

This most familiar and sometimes most troublesome condition is perhaps also the most common of all the disturbances peculiar to the pregnant state. It is not peculiar to the dyspeptic and hyperæsthetic woman alone, it occurs with all temperaments without partiality and may be most annoying to one who is least subject to physical or mental instability. The cause of this disturbance is plainly an irritability of the extensive nerve-supply of the uterus, which is subjected to an unusual—even though it be a physiological—stimulus. The nexus between the sympathetic nervous system of the uterus and the nerve-supply of the stomach by way of the hypogastric plexus is ample for the passage of impressions of irritability from the one viscus to the other, and it is a referred or transferred irritation of this kind which causes the troublesome gastric disturbance. The disturbance begins soon after the uterus begins to enlarge, and continues with more or less persistency until the uterus is well out of the pelvis; that is, until the sixth or seventh month of gestation, or even until its termination.

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Hyperemesis gravidarum is due to the enlargement of the uterus irritating the

motor nerves, as well as the sympathetic and the vagus, both of which when stimulated cause contraction of the stomach. Dirmoser (*Lancet*, vol. 1, No. 10, '97).

No constant pathological lesion is demonstrable in hyperemesis gravidarum; pregnancy is the predisposing cause; but in most cases the exciting cause cannot be discovered. In these cases pregnancy must be regarded as also being the chief cause, either on account of some abnormal course—twin gestation, hydramnios—or as occurring in a person of high nervous temperament. Pozzi (*Ther. Woch.*, No. 37, '97).

The pernicious form of vomiting is invariably accompanied by some pathological condition that may yet be discovered post-mortem, if looked for. The large majority of medical men ascribe it to pathological reflex phenomena originating in conditions present in connection with the pregnant uterus. Nervous temperament and hysteria are possibly not infrequent factors. Hedra's toxic theory has many adherents, while others follow Tumas, who believes he has located a vomiting centre in the medulla in close relation to the centre that presides over the generative organs; this centre shares in the reflex irritation of the generative centre, and gives rise to different impulses along the pneumogastriacs, which result in persistent nausea and vomiting. Temple (*Dom. Med. Mo.*, Sept., '97).

With some women it is an accompaniment of the first pregnancy only, and this is especially true with women who are pregnant for the first time after the tissues are all mature and firm: *e.g.*, after the thirtieth year of life. With others it recurs as often as pregnancy recurs. It is familiarly known under the name of "morning sickness," and is apt to manifest itself when the patient awakens in the morning. If she remain quiet in bed nausea may be the only symptom, and even this may be wanting, but the moment she rises and makes any effort, how-

ever slight, nausea with vomiting may result. The ingestion of food usually adds to her discomfort. It may be quickly rejected or it may become a disagreeable burden to be thrown off at a later period, or eventually it may be digested and assimilated. The disagreeable symptoms may wear away as the patient becomes occupied with her ordinary daily cares, or it may persist with obstinacy, unyielding from morning to night. Very few women are able to dispose of it by mere mental effort, and it may become so troublesome that the resulting weakness and malnutrition will prohibit attention to the daily duties. The patient may be obliged to keep her bed and even her life may be in danger from inability to retain sufficient nutriment. I have seen one such case in nearly twenty years of practice.

Three hundred cases of vomiting in pregnancy noted at the General Lying-in Hospital, and following conclusions arrived at: 1. About one-third of the cases had no vomiting during the first three months of pregnancy. No diagnostic importance can, therefore, be attached to it in first part of gestation. 2. In cases in which vomiting occurred it was present in the first months in 70 per cent.; it appeared in the last three months in 10 per cent. The maximum was observed in the second month. 3. The vomiting was most frequent in patients between 20 and 25 years of age. 4. It was present in 90 per cent. of the primipare. 5. There was less vomiting in the third pregnancy than in any of the others. 6. When vomiting occurred in the first three months, it increased with the weight of the placenta and child; but its influence was felt on the nutrition of the mother and not on that of the child. 7. Patients who suffered from dysmenorrhœa before pregnancy were less affected with vomiting than those in whom menstruation had been easy. Giles (Brit. Med. Jour., July 22, '95).

Literature of '96-'97-'98.

Ordinarily the vomiting of pregnancy is a comparatively insignificant affair. It begins shortly after conception, lasts from one to four months, and is easily controlled, or passes away without treatment. It occurs before and after eating, and the rejected matter is chiefly mucus, or mucus mixed with the food that has been ingested. The patient loses little flesh or strength. Again, it passes into an uncontrollable form, which at first is difficult of differentiation. Usually constant nausea and salivation are then present. The rejected material consists of mucus, food, or bile, and the vomiting may be either painless or painful. There are remissions permitting the ingestion of food; but later this becomes impossible, and loss of flesh and physical and mental depression occur. This marks the beginning of the second period, in which all the former symptoms are intensified, and constant fever and vomiting are added. The third period is recognized by the development of cerebral symptoms; the vomiting ceases, there are delirium, hallucinations, neuralgias, and finally coma and death. Pozzi (Ther. Woch., No. 37, '97).

Treatment.—The first essential of treatment is rest, as in gastric disturbance from any cause. Rest in bed may be all that will be required, the woman gradually resuming her duties as the stomach becomes less irritable.

Literature of '96-'97-'98-'99.

Review of the theories of various authors as to etiology of hyperemesis gravidarum, and the different lines of treatment advocated, summarized as follows:—

1. With Kaltenbach and Frank the term should be limited to those cases in which the vomiting is set up and kept up by the pregnancy, and the patient's nutrition suffers. 2. The reason of the hyperemesis in Kaltenbach's restricted sense is to be sought in a neurosis (Ahlfeld) or hysteria. 3. In the treatment of hyperemesis of the first and second degrees dietetic treatment by

the limitation of nourishment to liquids, with mental and bodily rest, is sufficient. 4. If treatment at home is not successful within a few days, treatment in an institution must be proposed. 5. If the vomiting does not then stop, the patient must be transferred to an institution. 6. Local treatment (with the exception of the treatment of dangerous complications, such as retroflexion of the gravid uterus) and treatment by drugs and suggestion are superfluous. 7. In hyperemesis of the third degree the artificial induction of labor is occasionally required. 8. To avoid this the earliest practicable treatment of the hyperemesis in the first and second stages is necessary. Klein (*Zeits. f. Geburts. u. Gyn.*, vol. xxxix, pt. 1, '99).

Lavage of the stomach with normal saline solution at a temperature of 100° F. will sometimes bring relief. The faradic current to the epigastrium has been recommended.

Uncontrollable vomiting of pregnancy successfully treated by faradization of the vagi before or after meals. Benefin (*Der Frauenarzt*, Sept., '95).

Literature of '96-'97-'98.

In hyperemesis gravidarum the stomach should be washed out by a solution of boric acid; the gases of the stomach should be absorbed by powdered charcoal made from the wood of the lime-tree, and food should be given by the rectum. When the patient is eventually able to take food by the mouth, it should at first consist of somatose and rice-water. Dirmoser (*Lancet*, vol. 1, No. 10, '97).

Blistering the cervical vertebrae, often recommended in vomiting of pregnancy, is generally useless and only adds to the discomforts of the patients. Unmarried women are not often afflicted. Limited sexual intercourse or absolute abstention should be enjoined. Pathological vomiting is not the vomiting of pregnancy, but vomiting *in* pregnancy. McDonald (*Montreal Med. Jour.*, Sept., '97).

There are only three abnormal conditions attending pregnancy in which suggestive therapeutics may be of use:

hyperemesis gravidarum, anorexia with disgust for certain articles of food, and abnormal craving for particular foods, and especially for unpalatable substances that are usually not regarded as food. Louis Lichtschein (*Med. News*, Sept. 3, '98).

In the treatment of vomiting of pregnancy, following suggestions offered: 1. The abnormal irritability of the nervous system, including the vomiting-centre, is to be allayed by keeping the patient in the horizontal position, by attention to the skin and bowels and kidneys, using rectal and, if necessary, hypodermic injections of salt solution. 2. The hysterical condition which is so commonly found present should be controlled by strengthening the will and influencing the dominant idea of the patient. 3. All sources of peripheral irritation should be discovered and treated. 4. In extreme cases subcutaneous saline injections serve the threefold purpose of (a) diluting the blood and increasing vascular tension; (b) eliminating toxins through renal and intestinal emunctories; (c) furnishing two most important kinds of food. 5. Induction of abortion is never indicated. At a stage when it is safe and efficient it is not necessary; and in extreme cases it adds greatly to the danger, rarely stops the vomiting, and can be substituted by the artificial serum. Bacon (*Amer. Jour. Med. Sci.*, June, '98).

Copeman's plan of dilating the cervix with steel dilators has been pronounced very efficient, but it will not always succeed.

Vomiting occurring during pregnancy stopped by application of tincture of iodine to the neck and inferior portion of the cervical canal. Iodine is applied with a brush, with the aid of a speculum. Routh (*Der Frauenarzt*, Mar., '92).

Good results obtained in treatment of vomiting in pregnancy by simple cauterization of the cervix; this measure is far superior to artificial abortion. Leclerc (*Gaz. des Hôp.*, May, '93).

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Case of hyperemesis gravidarum for which various remedies had been used

without success, until it was decided to empty uterus. In thirteenth week cervix was packed with iodoform gauze, with the woman in Sims's position. Vomiting immediately decreased, and in twenty-four hours ceased entirely. Abortion did not take place, and woman went on for another twelve weeks perfectly well. Then vomiting began again as violently as before, and in the twenty-sixth week gauze tamponade of cervix was repeated. Once more vomiting was greatly relieved, though not entirely stopped. A third time, in thirtieth week, vomiting became so severe that the cervical tamponade was used, and following this the vomiting again ceased entirely. In the thirty-third week vomiting recurred, and, as child was viable, pregnancy was terminated, living child being obtained and mother made a good recovery. F. A. Kehrer (*Centralb. f. Gyn.*, Apr. 11, '96).

Dilation of the cervix relieves vomiting of pregnancy very promptly in some cases, in others within a few days. As regards the ultimate procedure of emptying the uterus, the general tendency is to delay too long the operation, one which in itself is not without danger, especially in patients whose vitality is very low from inanition. Gardner (*Brit. Med. Jour.*, Oct. 23, '97).

As to the drug treatment, one may use a mixture containing

R̄ Bismuthi subnitri., gr. x.

Cerii oxal., gr. v.

Sodii bicarb., gr. v.

Cocainæ mur., gr. j.

This may be taken dry, upon the tongue, or the cocaine alone may be used.

Dilute hydrocyanic acid, in 1-drop doses, or pure carbolic acid, in 1-drop doses, are sometimes efficient.

Nine cases of vomiting of pregnancy in which orexin tannate yielded good results. As a rule, the desired effect was obtained after only a few powders had been given, and remained permanent even when the use of the remedy was suspended. F. Hermann (*Ther. Monats.*, xiii, p. 24).

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Orexin in doses of $4\frac{1}{2}$ grains, in capsules, three times a day, successfully used in vomiting of pregnancy. Rech (*Centralb. f. Gyn.*, Aug. 15, '96).

Oxygen-water employed with very great success in the treatment of the vomiting of pregnancy. Inhalations of oxygen are also useful. The oxygen-water employed contains 10 volumes of the gas, and is administered in the dose of 1 teaspoonful to the ounce, diluted with an equal quantity of water; to be taken in half to one teaspoonful at a time. Gallois (*Jour. des Pract.*, Mar. 20, '97).

Chloral and the bromides are the most useful remedies for subduing the reflex disturbance in vomiting of pregnancy, if administered per rectum in maximum doses of 120 grains daily. Locally, satisfaction found in the application of cocaine, combined with Copeman's method. Evacuation of the uterus is often too long delayed. Jewett (*Canadian Prac.*, Sept., '97).

Orexin given in doses of $4\frac{1}{2}$ grains, two or three times a day, followed by a little cold fluid, water or milk, has proved very prompt in relieving hyperemesis gravidarum. R. Frommel (*Therapist*, June 15, '98).

[Ingluvin in doses of 5 to 10 grains three or four times a day is frequently followed by marked success in controlling the vomiting. Ed.]

Finally there remains the emptying of the uterus as a last resort, and only as a last resort. It should only be done after careful deliberation and with the approval of skilled counsel. It should never be done merely to please or satisfy the patient or her friends.

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When the patient shows signs of exhaustion as manifested by rise of pulse to 115 or 120, and the vomit becomes dark brown or blackish, abortion should be induced without delay. This should be done under anaesthesia in most cases. Mauray (*Brit. Med. Jour.*, Oct. 23, '97).

Ptyalism.

This complication is far less common than the previous one. It consists in an aggravated irritability of the salivary glands, the saliva being poured out in an almost constant stream. It is apt to occur with primiparae, and in the first three or four months of pregnancy. Its effect is to weaken the patient and impair the digestive function. The quantity of saliva secreted in the twenty-four hours may amount to one or more pints. The saliva may be purely fluid or watery, or it may be mingled with an abundance of mucus, and be thick and ropy.

Treatment.—There is no remedy for this trouble which compares in efficiency, so far as I am aware, with the sulphate of atropine, which may be given in $\frac{1}{130}$ -grain doses repeated every three or four hours until physiological effects are apparent.

Literature of '96-'97-'98.

Two cases of ptyalism during pregnancy. In one case the cervix was cauterized, and bromides and cocaine were given, and, later, atropine, with good results. In the second case this treatment was without result, and abortion was procured. This was followed by cessation of the salivation. Lvoff (*Centralb. f. Gyn.*, No. 29, '97).

Displacements of the Uterus.

This condition may be present when pregnancy begins or it may be acquired at any period of gestation. The subject has already been alluded to in the foregoing pages. The displacement may be lateral, anterior, or posterior, and it may be more or less exaggerated. It may be simple or it may be complicated by adhesion of the peritoneal surface to the contiguous peritoneum. Whether the adherence exists at the beginning of pregnancy or is acquired subsequently, it is always an unfortunate—not to say a

dangerous—complication in so far as the continuance of pregnancy is concerned.

Lateral displacements are usually least significant in so far as disturbance to the pregnant state is concerned. If there are no adhesions the uterus usually corrects itself as pregnancy advances, and if no other complication supervenes parturition will follow in the natural sequence and involution will restore the organ to its normal place and relations in the pelvis. If adhesions exist or are acquired they may be pulled apart as the uterus enlarges, or their firmness may be such that they will not yield, uterine contractions being excited and the uterine contents expelled, or the latter may require removal at the hands of the physician. Anterior displacement may be slight or extensive and the uterus may or may not be adherent to the bladder. If the displacement is slight and there are no adhesions, spontaneous correction will result as the uterus enlarges and no further difficulty from this source may follow.

If the displacement is extensive, the subsequent enlargement of the uterus will be asymmetrical, the function of the bladder will be encroached upon, and there will be constant irritation of that viscus, with frequent micturition, and possibly the development of an annoying cystitis. This may continue until the end of pregnancy, or the irritation may be so great that uterine contraction and abortion will result. The danger of this mishap is greatly increased if the uterus has become adherent to the bladder. After the uterus has been emptied the union to the bladder may persist with such annoying symptoms that a surgical operation may be required to effect relief.

Should the uterus be displaced posteriorly the difficulties and dangers will usually be greater than in either of the other varieties of displacement.

The uterus may be merely retroverted or it may be acutely retroflexed. If the former, and there are no adhesions, Nature may again correct the trouble and no further difficulty ensue. If adhesions are present, the enlargement of the uterus will almost certainly produce such irritation that contractions and abortion will follow.

As a rule, it is best to keep a pregnant woman with retroversion at rest. The urine should be drawn off with the catheter several times a day. Tarnier (*Jour. des Sages-Femmes*, Oct. 16, '94).

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In the majority of cases of retroversion of the pregnant uterus, the condition is probably due to previous displacement, but it occasionally arises acutely from a strain or a fall. The bladder is more frequently an effect than a cause, but, once retroversion has taken place, an overdistended bladder will tend to aggravate the condition and prevent its cure. M. Cameron (*Brit. Med. Jour.*, Oct. 31, '96).

In 24,000 pregnant women Martin found 121 cases of retroversion and retroflexion, and in 94 cases retroversion persisted after repeated pregnancies. A. Mantle (*Quart. Med. Jour.*, July, '97).

Pregnancy probably occurs more often in cases of retroversion than is commonly supposed. Reposition can generally be effected. If unsuccessful, celiotomy is a better course than production of abortion, as it is practically without risk to the mother, and in most cases saves the fœtus. Eleven cases dealt with in this way; in 10 the patient's pregnancy went on to term; in only 1 abortion took place, four days after operation. Jacobs (*Jour. d'Accouchements*, Apr. 10, '98).

In cases of incarcerated retroversion of the gravid uterus, when all attempts at replacement *per vaginam* have failed, instead of inducing labor abdominal section should be performed and the fundus pulled up by the hand introduced behind it. If the uterus completely fills the

pelvis, attempts at replacement from below must fail. M. D. Mann (*Amer. Jour. Obstet.*, July, '98).

When the uterus is acutely retroflexed it is possible that the displacement may be remedied as it enlarges, but one must not depend too much upon the unaided effort of Nature. It will be far better to place the patient in the knee-elbow position, restore the organ to its normal position with the fingers, and then secure it with a tampon or a suitable pessary.

Many cases are susceptible of relief by such means which would otherwise terminate in abortion. If the uterus is retroflexed and also fixed by adhesions, relief may be obtained by the judicious use of the tampon or pessary, or the adhesions may be liberated as the organ enlarges; but in the majority of cases an abortion will be the result. With this displacement there are usually various annoying complications: the rectum is irritable from the constant pressure upon it and a troublesome diarrhœa or an equally troublesome constipation may ensue. Relief will come only when the cause has been removed. The bladder may also give trouble, owing to the constant traction at its neck, and the patient will be distressed with constant desire to micturate, each effort being followed by tenesmus. All things considered, uterine displacements bring about as much discomfort as any of the disorders to which the pregnant woman is subject.

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In retrodisplacements of the pregnant uterus spontaneous cure will be limited by four factors: adhesions, the sacral angle, the character of the displacement, and the degree of the displacement. If displacement be not corrected by Nature or art, sometimes pregnancy goes on to full term, the uterus becoming sacculated; much more frequently abortion takes place.

These retroflexed uteri have naturally much difficulty in expelling their contents. Challeix has reported 3 cases of extreme flexion in which the fœtus was retained 8, 5, and 1 month, respectively, after its death. If abortion does not take place grave results are generally not long delayed. Gottschalk has collected 67 deaths from this cause, and 10 more personally found, making a total of 77. Of these 13 were from rupture of the bladder, 18 from uræmia, and most of the others from sepsis, its origin being practically always in the bladder. Malcolm Storer (Boston Med. and Surg. Jour., Mar. 9, '99).

Embolism and Thrombosis.

Enlargement of the veins during pregnancy is not an unusual occurrence. The veins of the lower extremities and the vulva are most frequently implicated. The condition is less common in primiparæ than in multiparæ. If the blood-tension is weak the formation of thrombi is favored. Portions of these thrombi may be detached as emboli and, passing onward, may find their way into the arterial circulation, especially into the arteries of the lungs and brain. When arrested in these vessels the most violent symptoms may ensue: pain, dyspnœa, effusion, even death. Such accidents, however, are more frequently the sequences of labor, especially when the thrombi are formed within the uterus at the site of the placenta. Pregnant women who suffer with varicose veins should always be cautioned against violent exertions or anything which would tend to the formation of thrombi, or to their disintegration when formed. The treatment in such cases must necessarily be expectant and stimulating, the patient being kept in bed most of the time upon fluid diet. If it is necessary or desirable that she should be up and around, the feet and legs should be bandaged, but not too firmly.

Ectopic Gestation.

This terrible complication rarely exists as an accompaniment of uterine gestation, though such cases are not unknown. It will be considered at this time only or mainly as a complication of pregnancy, and not with that detailed statement which would be required in connection with the unimpregnated uterus.

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Case of a peasant woman, 35 years of age, who had three normal deliveries at term and one miscarriage. Later a laparotomy was performed for an abdominal tumor on the right side of the uterus, which was thought to be an extra-uterine pregnancy. Upon opening the abdomen a uterus bicornis was found. The right cornu contained a fœtus, and the left tube, owing to a recently-ruptured tubal pregnancy, had changed into an hæmatocele. Introduction of sound into uterus, and other manipulations, led to expulsion of the intra-uterine ovum also. Recovery normal. Walther (Zcitsch. f. Gyn., B. 33, H. 3, '96).

Case of combined intra-uterine and extra-uterine pregnancy in a colored woman, who was the subject of miscarriage. A 3½-month fœtus was found in the bed, and bimanually the secundines were expressed. Four hours later patient was seized with intense abdominal pain, was in a collapsed condition, with pulse 160 and shallow breathing. The abdomen was rigid, tender, and dull on percussion. No rupture of the uterus could be found. Patient died. On post-mortem examination the left Fallopian tube was found to be ruptured, and among the blood-clots in the pelvis was a fœtus about 3½ inches long. C. J. Miller (New Orleans Med. and Surg. Jour., Oct., '98).

The ectopic-gestation sac usually ruptures from the sixth to the tenth week of its history and it would be almost an impossibility for ectopic gestation to occur after utero-gestation had been established. If, therefore, the two

conditions co-exist, the former will usually begin coincidentally with the latter or a short time—a few weeks—previously. Utero-gestation usually causes the abeyance of menstruation, but when it co-exists with ectopic gestation one of the first symptoms indicative of the situation will be hæmorrhage. This may appear at the customary time for menstruation, thus misleading the patient with regard to her condition, or it may appear a few days or weeks subsequently. But it will differ from the customary menstrual flow by its continuance after the usual duration, and also by its greater abundance. This fact may serve to warn the patient that her condition is not that which attends ordinary menstruation. The bleeding may or may not be attended by the discharge of shreds of decidua, this being by no means a constant symptom.

A more forcible indication of the patient's condition will be pain, which signifies both a stretching of the abnormal-gestation sac and its subsequent rupture with hæmorrhage either into the peritoneal cavity or into the space between the folds of the broad ligament. The pain is sharp and cramp-like; recurs in frequent paroxysms, and may be so severe that it, in connection with the accompanying concealed hæmorrhage, may result in anæmia and collapse. If the rupture occurs at a very early period the foetus (ectopic) may die and be absorbed together with the effused blood. The uterine gestation may terminate with an early abortion; but this rule need not be considered invariable. There is very little literature upon this phase of the subject.

Case diagnosed as extra-uterine pregnancy. Electricity, both galvanic and faradic, had been applied. Section was done, and the condition found to be a normal pregnancy, and the tumor that had been felt was an enlarged and in-

flamed ovary. H. C. Coe (*Amer. Jour. of Obstet.*, Jan., '90).

The only condition that closely resembles early tubal pregnancy is pregnancy in a retroflexed uterus. Jaggard (*Jour. Amer. Med. Assoc.*, Jan. 24, '91).

Diagnosis of extra-uterine pregnancy of early months made upon four grounds: (1) the general signs of pregnancy,—for example, the cessation of the menses; (2) the displacement of the uterus to one side by the tumor, which gradually grows; (3) the passage of the decidua, in whole or in part, in an irregular hæmorrhage; (4) the presence of paroxysmal pain, localized to one side, though not to one spot. Croom (*Edinburgh Med. Jour.*, Oct., '91).

When any woman, who has menstruated regularly and who has passed her period from four to twelve weeks, is suddenly seized with pain in either iliac region, becomes faint, dizzy, nauseated, pale, generally unable to sit up, tender and sensitive over lower part of abdomen, having a frequent desire to go to stool without being relieved, and when, upon vaginal examination, a boggy mass is found at one side and posterior to the uterus, and a slight, bloody, shreddy, mucous discharge occurs, she has the classical symptoms of a ruptured tubal pregnancy. H. D. Ingraham (*Buffalo Med. Jour.*, Aug., '95).

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Extra-uterine pregnancy may be mistaken for (1) pyosalpinx with amenorrhœa; (2) myoma; (3) simple abortion; (4) retroflexion of the gravid uterus; (5) antelexion of the gravid uterus, and (6) twisted pedicle tumors: (a) of the tube and (b) of the ovary. J. W. Taylor (*Brit. Gynæc. Jour.*, Nov., '98).

Internal hæmorrhages from the tube and ovary are not always the result of tubal pregnancy. Bovee (*Amer. Gynæc. and Obstet. Jour.*, May, '98).

Concealed hæmorrhage, pain, and shock may demand immediate surgical assistance, and this will be the rule when the gestation-tumor has reached the size of a hen's egg or something larger. Even

a smaller tumor upon the fimbriated extremity of the tube may rupture and cause these symptoms, the danger to life being very great, since the hæmorrhage is into the peritoneal cavity with no resisting tissues to check it. (This form of ectopic gestation has been termed tubal abortion by Bland Sutton.) If the rupture takes place into the space between the folds of the broad ligament, development of the fœtus may continue to term, the uterine gestation continuing *pari passu* or ending in abortion. A number of cases have been recorded in which the ectopic fœtus has been capsulated in the abdominal cavity and has become an inert mass, uterine gestation supervening once or oftener without apparent disturbance from this foreign body. This seems less remarkable, however, when one realizes how frequently pregnancy is successfully accomplished in the presence of all sorts of pelvic and abdominal tumors.

Six hundred and twenty-six cases of ectopic gestation analyzed, the collective mortality of which exceeded 41 per cent. In a spontaneous course it reached a mortality of 68.8 per cent. The most common form of ectopic gestation is that of tubal pregnancy. Schauta (Centralb. f. die med. Wissen., Oct. 31, '90).

Eighty-three ectopic pregnancies noted in eight thousand labors. The dangers or causes of death may be hæmorrhage, septicæmia, peritonitis, or perforation of important viscera by bone. Of these, hæmorrhage is the most frequent. Joseph Price (Amer. Jour. of Obstet., Dec., '92).

In extra-uterine pregnancy the mortality in cases of pelvic hæmorrhage depends, first, upon the amount of blood lost and, secondly, upon the profundity of the shock. Death due to loss of blood alone is extremely rare. For some reasons the extravasations from a ruptured fœtal sac are attended by a shock which is out of all proportion to the amount of blood lost. In such instances the patient

suffers not only from the loss of blood, but also from the extensive wounding of the peritoneum: the so-called peritoneal shock. In fatal cases of this kind death takes place in the course of a few hours. Mortality in deliberate operations upon well-prepared patients in good condition, at the hands of an experienced operator, is very small, indeed; that of operations of urgency considerable. Early operation is always desirable in doubtful as well as in certain cases. M. H. Richardson (Annals of Surg., Dec., '94).

Treatment.—The only remedy for the complication which is under consideration consists in the complete removal of the offending mass at the earliest possible moment after it has been discovered, and this may sometimes be done without interruption of the utero-gestation, especially if the tube and ovary on the uninvolved side are healthy and do not require removal. If the appendages on both sides must be removed the diversion of so large a portion of the nutrient blood-supply of the uterus will almost inevitably result in the premature termination of the uterine gestation.

Fifty-three cases of ectopic gestation treated with electricity, with four deaths; subsequent health of patients good. Risk of rupturing the sac of an extra-uterine pregnancy, causing death from internal hæmorrhage, is slight.

Electropuncture condemned in all cases. Under galvanism or faradism, early extra-uterine pregnancy can be checked in its growth, caused to disappear or shrivel up. A. Brothers (Amer. Jour. of Obstet., Feb., '90).

[While treatment in the earlier months by electricity for the destruction of the fœtus has been ably advocated by Lusk, Skene, and others, it has been as ably opposed by Baldy, Tait, and others; first, because of the difficulty in determining the diagnosis of extra-uterine pregnancy before rupture of the sac; second, from the danger of the suppuration of the fœtal sac; third, because the means are in many cases ineffectual to

bring about the results desired. E. E. MONTGOMERY, Assoc. Ed., Annual, '91.]

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In treatment of extra-uterine gestation, where there is free intraperitoneal hæmorrhage, while heart-stimulants, notably strychnine, should be freely employed hypodermically, infusion of normal salt solution is strongly indicated; this, however, should never be infused into the circulation until the bleeding vessels have been secured. Removal of the tube and cleansing of the peritoneal cavity can then be done. C. N. Smith (Ann. of Gyn. and Ped., Aug., '96).

Thirteen cases of vaginal section of extra-uterine pregnancy, with good results. Cases suitable for this mode of treatment are those that rupture in the early months. Vaginal puncture and drainage are not suitable in an unruptured extra-uterine pregnancy. Most suitable cases are those in which a succession of ruptures has occurred. H. Kelly and F. Henrotin (Amer. Gyn. and Obst. Jour., Aug., '96).

In every case of extra-uterine pregnancy where the fetus lives after the rupture it is owed to its being protected by an unruptured amniotic sac.

Primary rupture in 99 per cent. of all cases, even in those which go to term, is into the peritoneal cavity, and not into the cavity of the broad ligament. This statement rests on examination of over 200 cases. The most dangerous variety is the interstitial. In any form of tubal pregnancy operation should be performed as soon as the diagnosis is made. Before sixth month the placenta is generally easily removed, but from the seventh month on with a living child its removal is generally impossible. In such a case the placenta must be cleaned, the cord cut, and the abdomen closed, or the abdomen can be left open and the placental surface packed with gauze until the placenta comes away. Mordecai Price (Univ. Med. Mag., July, '98).

Treatment of ectopic pregnancy is by immediate operation as soon as diagnosis is made.

In cases left without operation all the children and 76 per cent. (Martin) of

the mothers die. By early operation the mortality should not be over from 6 to 8 per cent. (Kelly). If the child is viable, an operation should be performed at once; if nearly so, operation should be delayed until the child is viable. If the child has just died it is better to wait a few weeks, unless the symptoms are urgent, as the circulation in the placenta will then stop and it will become loosened, thus lessening the danger of hæmorrhage and making the removal much easier. E. M. Pond (Med. Rec., Dec. 24, '98).

In cases of unruptured ectopic gestation the vaginal operation, if congenial to the surgeon, may be elected. In non-active cases of encysted hæmatocele vaginal section and drainage constitute the operation of choice. Situation of mass low down, and the broad, roomy vagina of parous women are favorable to lower route. Before evacuating ectopic collections through vagina preparation for abdominal section should be made. In cases of free or uncontrollable hæmorrhage, after removing products of ectopic gestation vaginally, the abdomen should be opened at once. Vaginal operation in appropriate cases is attended with less mortality. W. D. Haggard, Jr. (Amer. Gyn. and Obst. Jour., July, '98).

Conclusions regarding extra-uterine pregnancy are:—

1. Extra-uterine pregnancy is more frequent than is generally believed.

2. When left to Nature's resources, the mortality is very high, the patient dying from primary hæmorrhage, or, secondarily, from sepsis and peritonitis.

3. The diagnosis is usually easy after the rupture takes place.

4. The surgical mortality, in skilled hands, when done in time, is very low.

5. No case of ruptured tubal pregnancy is out of danger until after a good ligature has secured the bleeding-points.

6. The abdominal route is the best and safest manner of approach in these cases.

7. Most cases should be irrigated properly and drained after removing the diseased tube and liberating all adhesions. Cordier (Annals of Gyn. and Pæd.; Amer. Medico-Surg. Bull., July 10, '98).

Treatment of tubal pregnancy by vaginal route is not only possible, but advisable under the following conditions: In case of absolutely certain diagnosis, provided the pregnancy has not gone on for more than two months; the pelvic measurements should be normal and the vagina and pelvic floor elastic; the uterine ligaments should be of normal elasticity; the operator should be familiar with the technique of vaginal operations. Ph. Becker (Centralb. f. Gyn., Jan. 14, '99).

In early ectopic gestation, if the sac of the ovum has not been ruptured, the entire ovum should be extirpated as soon as possible. If the sac ruptures into the abdominal cavity, and hæmatocele does not form, abdominal section should be done at once.

When, nevertheless, hæmatocele has formed and is distinctly limited, operation should be undertaken for positive and complicating indications only.

In cases of tubal abortion, either with or without hæmatocele, and where a dead ovum is retained in the tube, there is no stringent call for interference, but patient should be kept under observation. Veit (Zeit. f. Geburts. u. Gyn., B. 60, H. 1, '99).

Pruritus Vulvæ.

This is one of the most annoying troubles of the pregnant state, and occurs alike in primiparæ and multiparæ. It consists in an intense and intolerable itching of the skin of the labia and circumanal region and sometimes the mucous membrane of the vagina, and is especially annoying at night after the patient has retired to her bed. The rubbing and scratching which are provoked induce excoriation and sometimes severe inflammation of the skin, often lead to the formation of the masturbation habit, and may make the patient's life truly miserable. There may be very little external evidence of disturbance, or the skin may show cracks and abrasions. It is sometimes dry, red, and parchment-like; in other cases it is moist, with

transuded serum, and the entire vulva may be swollen, hot, and painful to the touch.

There are three principal causes, according to my observation: 1. Discharges from the vagina or cervical canal. 2. Parasites of the skin. 3. Irritation of cutaneous nerve-endings of central origin.

Discharges from the vagina or cervical canal. The turgid, congested condition of the vagina and uterus during pregnancy conduces to the hypersecretion of glandular fluid and the transudation of serum from the vessels. This discharge may be bland and unirritating or it may be acrid and corrosive. Want of cleanliness and possibly the action of the bacteria of the skin favor the development of the troublesome condition. The discharge may be white and watery, or colorless and slimy, and it may be scanty or abundant.

TREATMENT.—The measures I have found efficacious consist in drying the skin and mucous membrane with absorbent cotton, tamponing the vagina with cotton-wool soaked with a paste of glycerin and subnitrate of bismuth, and covering the skin with a thick layer of the same. This should be repeated daily and will usually bring relief.

As to skin parasites, these are the ordinary *Pediculi pubis*, which adhere tenaciously to the roots of the hair of the vulva. Mercurial ointment rubbed into the skin a few days in succession will destroy them.

As regards irritation of cutaneous nerve-endings of central origin the cutaneous nerves are irritated, in all these conditions, but in this variety the source of the trouble is not local.

Diabetes may produce this condition, though the irritant, in some cases at least, is the urine, which has been allowed

to soil the skin. The treatment will consist, first, as in all cases, of cleanliness, then the application of the glycerin-and-bismuth paste or of vaselin or zinc ointment with which a sufficient quantity of cocaine or carbolic acid (15 grains to the ounce will usually suffice) has been combined. The causative disease must, of course, receive proper treatment at the same time.

Literature of '96-'97-'98.

Ichthyol is rationally and logically indicated in all cases of vulvar pruritus, used either as a 10-per-cent. ointment, plaster, or lotion (aqueous). Doizy (Bull. Méd., xii, p. 904, '98).

Œdema.

Œdema of the external genitals, the lower and upper extremities, may properly be considered together, for it in all cases results from the same cause,—namely: interference with the venous circulation,—the first being more frequent than the other two.

Œdema of the vulva is very common, the tissue becoming quite dark, sometimes almost black. The veins may be greatly enlarged and the swelling of the tissues so extensive as to be painful and make locomotion difficult. The treatment consists in the application of cooling and astringent lotions—*e.g.*, the lead-and-opium wash—and rest in bed the greater portion of the time. This and the other two conditions are accompaniments of the later months of pregnancy when the weight and pressure of the heavy womb impair the freedom of circulation of the blood-current. Œdema of the lower extremities is especially apt to occur with those who suffer with varicose veins of the legs, with cooks and washerwomen, and others whose duties compel them to be standing from morning until night.

TREATMENT.—This is the same as for

œdema of the vulva, rest in the horizontal position being all-important. Bandaging the feet and legs, the bandage being carried well above the knees, will often give comfort and enable the patient to go about in the pursuit of her ordinary duties.

Œdema of the upper extremities I have never seen. It would indicate a very bad condition of the circulation and a probable lesion of the heart. In addition to appropriate treatment of the central cause, rest in bed is imperative, and the limbs should be lightly bandaged from hand to shoulder if the swelling is considerable.

Hæmorrhoids.

This condition is often a source of great annoyance, especially in the later months of pregnancy. It may be regarded as similar in its causation with œdema of the vulva, and, indeed, may accompany it. It is more frequent with those who have suffered with the same trouble prior to pregnancy than with others, it is common with those who suffer with constipation, and is a source of great pain when the bowels are moved.

TREATMENT.—Surgical measures are only indicated when the hæmorrhoids are very large and pediculated or are the source of unusual pain and discomfort. Rest in bed and the use of astringent and sedative lotions, such as have already been mentioned, and the careful regulation of the bowels will usually bring relief. This may, however, only be temporary, the permanent relief being postponed until pregnancy has terminated and the pressure and congestion have disappeared. (See HÆMORRHOIDS, vol. iii.)

Uterine Pain.

This condition may be brought about in many ways: *e.g.*, by a rigid and unyielding condition of the tissues of the organ, the pressure of contiguous viscera,

emotions of various kinds, the movements of the foetus, traumatism from without, etc. The pain may be sharp or prolonged and aching, and is due to the contraction of the muscular fibres of the uterus. It may recur at frequent intervals, and if it should continue for a period of several hours it would result in the emptying of the organ.

TREATMENT.—Rest, the horizontal position, and an occasional hypodermic of morphine (morphine sulphate, $\frac{1}{8}$ grain; atropine sulphate, $\frac{1}{120}$ grain), given only when pain is severe, may be used for its relief. The pain may be so evanescent that no treatment will be required other than the avoidance of its cause, if that can be discovered.

Spurious Pregnancy.

This can hardly be considered a *disorder* of pregnancy, but it deserves consideration especially since the physician should always be on his guard to distinguish it from the *real* condition. Many ludicrous examples of spurious or supposed pregnancy have been recorded, among them that of Queen Mary, of England, who repeatedly set the day for her *accouchement* only to disappoint as frequently her dissatisfied and, it is said, disgusted, lord, Phillip II, of Spain. Spurious pregnancy originates generally in a desire to become pregnant, which may become an intense yearning. The condition depends principally upon the presence of an abdominal tumor which may undergo enlargement suggestive of the enlargement of the gravid womb. Symptoms of true pregnancy are also sometimes present, including the "morning sickness" and the violet discoloration of the mucous membrane of the vagina, which is due to impaired or disturbed circulation the same as in utero-gestation.

The tumor may be uterine or extra-

uterine, ectopic pregnancy being excluded. Of the extra-uterine tumors the simplest form is due to the presence of gas in the bowels. Strange as it may seem, this may persist for weeks and delude the patient completely. This "phantom tumor" is not uncommon and its sudden collapse is likely to cause the greatest surprise, if not disappointment. The other simulative form of extra-uterine tumor consists in the various types of cysts or solid growths, especially those of the ovary. These tumors sometimes grow very rapidly, this being especially true of the malignant tumors of the abdomen. In the early days of ovariectomy unmarried women were repeatedly accused of pregnancy when suffering with ovarian cysts. Not infrequently an ovarian or other form of abdominal tumor develops coincidently with utero-gestation.

The tumors of the uterus which simulate pregnancy are principally of two forms: those which are due to the presence of fluid and those which are due to the presence of gas. Rarer forms are the hydatid tumors, and the so-called molar pregnancy, or hydatidiform mole. Solid tumors (fibroids) of the uterus develop so slowly that they are seldom mistaken for pregnancy, though the contour of the fibroid uterus is often very suggestive of gestation. Molar pregnancy is, in reality, a myxomatous tumor due to proliferative degeneration of chorionic villi. It is formed usually in the first, but not later than the third, month of pregnancy. Beginning as a true pregnancy, the foetus dies early in its history and is absorbed. Cysts of varying size, from a small seed to a walnut, filled with a mucous fluid, are formed in great numbers and are occasionally detached. Abortion may occur prior to the sixth month or the condition may go to term

or even longer and require surgical interference. Death from hæmorrhage is one of the dangers which is to be apprehended.

Hydatid tumor of the uterus is extremely rare. Lusk says that but one authentic case has been recorded. The diagnosis depends, of course, upon the actual presence of acephalocysts or their hooklets. The cystic tumors in molar pregnancy are suggestive of acephalocysts; hence the term hydatidiform mole.

The forms of simulated pregnancy in which the uterus is enlarged by a collection of fluid or gas are known as hydrometra (a collection of more or less watery fluid), pyometra (a collection of purulent fluid), hæmatometra (a collection of blood), and physometra (a collection of gas).

These are unusual conditions, and have received very little investigation, so far as I have been able to ascertain. Most of the works on obstetrics and gynecology are silent concerning them. They must not be confused with those cases in which there is disease of the decidua, the amnion, or the placenta, and in which true, and not spurious, pregnancy is present. They are all conditions in which infection is probable. Just what its nature may be it is difficult to say.

The enlargement of the uterus from the retention of menstrual fluid might also be regarded as simulative of pregnancy and is not a very rare condition. It occurs principally in young unmarried women. In all these cases of uterine enlargement the indication is to empty the uterus and usually it will be proper to follow this procedure with irrigation and curettage. The latter operation must be performed with caution and discrimination, and in most cases a light tampon should be introduced into the organ and retained two or three days.

Concealed Pregnancy.

This condition requires only brief notice. It implies a situation which is marked by other more palpable and demonstrable conditions; especially by the various solid and fluid tumors of the pelvis and abdomen. These tumors exist and may have been discovered prior to the pregnancy. With cystic tumors, pregnancy may occur and perhaps continue to term, but the latter may not be discovered until it is far advanced. With solid tumors, especially those which involve the structure of the uterus, the resistance is greater and pregnancy is usually interrupted or at least interfered with before it has progressed very far. In some cases delivery at term becomes impossible by the ordinary channel, and an abortion must be induced, the tumor must be removed, or else it may be necessary to remove the fetus through an abdominal incision. Concealed pregnancy may, therefore, be a most undesirable complication. Rarely pregnancy takes place under normal conditions and the situation is not suspected until a late period. The menses appear at regular intervals, the abdomen does not show the usual symmetrical enlargement, and for various reasons the woman does not realize that pregnancy is present. Of course, the only treatment which is indicated is the expectant one, the pregnancy being allowed to continue without interference until the fetus is discharged at term.

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PRESENTATIONS. See PARTURITION.

PROGRESSIVE MUSCULAR ATROPHY. See MUSCLES and SPINAL CORD.

PROLAPSE. See various organs subject to prolapse: UTERUS, VAGINA, RECTUM, etc.

PROSTATE GLAND. See URINARY TRACT.

PSEUDOLEUKÆMIA (HODGKIN'S DISEASE).

Definition.—This obscure disease may be defined as an hypertrophy of the lymphatic tissues, accompanied by an anæmia, but without leucocytosis. It resembles in many respects the granulomata, neoplastic proliferation, and true leukæmia. In the glands of many undoubted cases of Hodgkin's disease tubercle bacilli have been found; such is, however, not a constant condition. From the sarcomata it usually differs by virtue of its wide-spread implication of the lymphatic system: yet undoubted sarcoma may be almost universal. The local lesions are almost identical with those seen in leukæmia, and cases of apparent Hodgkin's disease have become converted into true leukæmia; yet the absence of leukæmic leucocytosis is usually one of the most striking features of the disease. While we are at present only upon provisional ground, pathological analogy aids us in interpreting pseudoleukæmia as a peculiar infection, in which a noxa acts upon the lymphatic tissues and stimulates them to excessive proliferation. Of the nature of the infection we are entirely ignorant. We do not know the portal of infection, but from the fact that the disease so often begins in the cervical glands, it has been supposed to be through the mouth and throat. It may occur at any age, usually during young adult life.

Symptoms.—Instances of acute pseudoleukæmia have been described, with fever, hæmorrhages, glandular enlarge-

ments, marked toxæmia, and an early death. While some such have been authentic and well verified, in a majority of instances acute leukæmia, sepsis, and the purpuræ have not been excluded.

The disease is usually chronic, and the symptoms may be grouped as toxic or mechanical. In some cases the toxic symptoms precede all others, but usually the glandular enlargements are the first signs. The cervical glands are commonly the ones first involved, but some one or several of the other groups soon become implicated. There is more or less pain connected with the swelling, and the glands may be tender to the touch. The cervical enlargement alters the appearance of the patient, and produces quite a characteristic facies. The axillary enlargements cause the patient to hold the arms away from the chest; they may press upon the nerve-trunks and cause intense pain, or may produce a destructive neuritis, with all of its symptoms; they may obstruct the flow of blood in the axillary veins and thus produce extreme cyanosis and œdema of the arm. The enlargement of the inguinal glands induces a peculiar attitude on standing, and the subjects walk with circumspection; pressure symptoms are not uncommon.

The general symptoms are those of weakness, malaise, and asthenia; the patient loses flesh, fever is often present, and regular or irregular sweats may occur. The skin is usually a pale, sallow color; it may exhibit petechiæ and œdema. Bronzing has been observed. Accidental eruptions are common.

Literature of '96-'97-'98.

In case of leukæmia under observation for 3½ months, there was a daily rise of temperature followed by a gradual fall during the whole period. Von Hajek (Wiener klin. Woch., May 20, '97).

Case of Hodgkin's disease in patient, 17 years of age, who had been ill only seven weeks. The lymph-glands in the neck, axillæ, and groins were enlarged, as were also the spleen, which extended two inches below the level of the umbilicus and the liver. The interesting feature was the occurrence of a bilirubin jaundice, not hitherto described in this complaint. This was probably due to blood-destruction from capillary hæmorrhages. This view was supported by the fact that while the percentage of corpuscles was 38, that of hæmoglobin was 45. F. H. Edgeworth (Bristol Medico-Chir. Jour., Mar., '98).

Symptoms involving the respiratory tract are frequent and important. The nares may be closed by the lymphatic overgrowth. The laryngeal growths may modify or abolish the voice or produce obstruction. The trachea may be pushed far to one side and deeply buried beneath the mass of enlarged cervical glands; it may be seriously and fatally stenosed. Pressure upon a bronchus or a portion of the lung may produce collapse of the lung-tissue, with subsequent pneumonia, abscess, or gangrene. Dyspnoea of several types occurs; it may be hæmic, cardiac, due to pressure upon some part of the respiratory tract, or rarely to pleural effusion due to pressure upon the azygos vein. The laryngeal nerves may be pressed upon, as may the vagus, with their corresponding symptoms. Hæmoptysis is uncommon; epistaxis not infrequent.

Circulatory symptoms consist of rapid cardiac action, hæmic basal or apical murmurs, the murmurs and pulsation in the jugular veins, nutritional disturbances due to pressure upon vascular trunks, and peripheral or central hæmorrhages. Endocarditis and pericarditis are rare. The mediastinal growths may displace the heart and seriously disturb its action.

The alimentary symptoms are important. Stomatitis and pharyngitis are not rare, while dyspeptic symptoms are common. Crises of pain are probably the result of nerve-pressure. Dysphagia may be produced by pressure. The liver may be enlarged, and the enlarged glands at the hilum, which may be palpable, may cause, by pressure, ascites or jaundice. Constipation is the rule; diarrhœa should excite suspicion of intestinal ulceration. Hæmatemesis and melæna are uncommon. The retroperitoneal glands may be palpable, as may the nodules in the intestinal tract.

Other symptoms are irregular. Albuminuria is uncommon, but amyloid disease may induce it. Casts may be present. The urine seems to be nearly normal. In particular the uric acid and the purin bases are usually not increased. Disturbances in urination are rare. Pains in the bones are sometimes complained of. The menstrual function is usually disturbed, but sterility does not follow in either sex. Insomnia, vertigo, and headaches are common. The local nervous symptoms are those of pressure: pains, paræsthesia, anæsthesia, paralysis, and trophic changes.

The condition of the blood is that of a simple anæmia. There is a moderate oligocythæmia and a slightly disproportionate oligochromæmia. Poikilocytosis is usually moderate, and nucleated red cells are not frequent. The leucocytes are usually quite normal, both as to quality and quantity. Some cases exhibit a simple polymorphonuclear leucocytosis, particularly during the last stages; in a few cases the eosinophilic cells are increased, while in other cases a lymphocytosis may be present.

Five cases of pseudoleukæmia observed in none of which was there marked leucocytosis or the color-reactions of Ehr-

lich. Baginski (Archiv f. Kinderh., B. 13, H. 4, 5, 6, '91).

Remissions and exacerbations are of frequent occurrence. The glands may decrease in size and then may increase, and with these alternations the symptoms, particularly the fever, fluctuate. The duration of the disease is from six months to several years. The disease is nearly always fatal.

Diagnosis.—In adults it must be diagnosed from the granulomata, sarcomata, and leukæmia. As against sarcoma, the extent of the implication, the rapidity of the process, the leucocytosis, and the cachexia will usually permit of a diagnosis. Ordinary lymph-tuberculosis is localized, and sooner or later the glands break down; there are, however, instances of wide-spread lymph-tuberculosis in which no caseation occurs, and such can be with difficulty separated from pseudoleukæmia. In children rickets, syphilis, amyloid disease, chronic gastro-enteritis, or any of the secondary anæmiæ which produce splenic enlargement must be excluded.

Pathology.—In pseudoleukæmia the implication of the lymphatic tissues is wide-spread. It is never confined to one set of glands, nor has it ever been shown to have been confined to the spleen or to the bone-marrow. The glands may become enlarged singly or in chains. The capsule is usually thickened, and the growth does not tend to break through it. Early in the disease the glands are soft, later they may become hard. They may be gray in color, may have a chloromatous hue, may be deeply pigmented, or may be hæmorrhagic. Softening and necrosis are not common, and the surrounding tissues are rarely adherent to the glands.

Microscopically there is a marked hyperplasia of the lymphatic cells.

While these are of the common lymphatic type, there is a noteworthy polymorphism in the cells. There are also present fibroblasts, large endothelial cells, and globuliferous giant cells. The walls of the blood-vessels are not implicated. The typical arrangement of the germ-centres is entirely distorted, but there is no predominance of the mother-cells, such as is seen in the glands in acute leukæmia, the condition resembling more those exhibited in chronic lymphæmia. Cellular degenerations are frequent, while mitoses bespeak the rapid proliferation.

The cervical, axillary, inguinal, mediastinal and retroperitoneal glands are most heavily involved. The faucial and pharyngeal tonsils are often affected. Adventitious lymph-nodules may appear in the skin, in the nares, in the larynx and the bronchi, in the liver, kidneys, adrenal bodies, ovaries, and testicles, while the follicles within the alimentary tract may be much enlarged. The spleen is usually enlarged to a moderate degree. It is commonly hard, is often mottled, and may present distinct tumors. The bone-marrow is often splenified: a condition not at all specific, but seen in many extreme anæmiæ. Sometimes there is a lymphatic overgrowth. The periosteum may exhibit infiltration. The central nervous system is rarely implicated, as are the mammæ, the organs of special sense, the salivary glands, and thyroid body; in young subjects the thymus is often enlarged.

The general tissues often exhibit a marked degree of fatty degeneration. Amyloid change has been described. There is usually marked wasting of the tissues.

Treatment.—Large doses of arsenic seem to check the lymphatic enlarge-

ments, improve the anæmia, and better the general health. The best of hygiene and food, together with tonics, is very important. Mercury, iodine, salicylic acid, ichthyol, and green soap may be applied to the skin over the enlarged glands; while they may alleviate the pain and retard the enlargement, they do not check it. The same is true of electricity. Surgical interference is often necessary for the relief of pressure symptoms, particularly tracheotomy, which is here especially difficult. Pseudoleukæmics bear operation fairly well. It is not probable that excision of the glands or of the spleen can in any way modify or check the disease.

Following preparation recommended for subcutaneous injection of arsenic in Hodgkin's disease: 15 grains of arsenous acid are boiled in a test-tube, with 75 minims of caustic soda, until wholly dissolved; the fluid is then washed into a graduate, diluted to 3 ounces, and filtered. For use 30 minims of the fluid are placed into small glass vessels, plugged with cotton, and sterilized in steam-bath. Of this 1 per cent. liquor sodii arsenitis, the initial dose subcutaneously is 4 minims once daily; after a few days twice daily. The dose is gradually increased until a Pravaz syringe-ful (15 minims) twice daily is reached: *i.e.*, a daily dose of $\frac{1}{4}$ grain of arsenate of soda. Von Ziemssen (Deutsch. Arch. f. klin. Med., lvi, Nos. 1 and 2, p. 124, '95).

Case of pseudoleukæmia (Hodgkin's disease) cured by subcutaneous injections of arsenic.

In all 100 injections of Fowler's solution were given. The initial dose was $1\frac{1}{2}$ minims diluted one-half with distilled water. At the beginning the dose was increased $\frac{3}{4}$ minim every third day, until 1 Pravaz syringe-ful (15 minims) of pure Fowler's solution daily was reached. The diminishing doses were given during a period of four weeks, when injections were suspended, and the case discharged as cured. Moritz Kat-

zenstein (Deutsch. Arch. f. klin. Med., lvi, Nos. 1 and 2, pp. 121-124, '95).

Literature of '96-'97-'98.

Case in which fatal termination seemed imminent notwithstanding arsenic (given internally) backed by bone-marrow.

Although bone-marrow tabloids had previously been tried in a case of the same disease in an adult without the smallest benefit, they were used in this case, beginning with 1 thrice daily. The third day vomiting and diarrhœa had ceased and the temperature was normal. This improvement steadily continued. The number of tabloids taken was gradually increased, till at the end of a fortnight she was taking 6 in the day. After two months she was apparently in good health, although the sub-maxillary and one of the cervical glands were still large. The tabloids were finally stopped. A fortnight afterward she was once more somewhat anæmic, and with the glands, which had subsided to normal, appreciably enlarged. The tabloids were resumed, three a day; she is now a plump, healthy child, but she still presents slight enlargement of the submaxillary and one cervical gland. J. D. L. Macalister (Brit. Med. Jour., Nov. 13, '97).

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PSORIASIS.

Definition.—Psoriasis is a cutaneous disease characterized by the presence of silvery-white perfectly-dry scales, which overlie a reddish, shining base.

Symptoms.—The eruption of psoriasis is always dry and scaly. It begins in one or more red points, which quickly become covered with white, silvery scales. These may be readily scratched off by the finger-nail, and when this is done a bleeding surface is exposed. When many of these small, scaly lesions are present, the eruption is described as *punctate psoriasis*, and this form of the eruption is comparatively more frequent

in children than in adults; when the scaly lesions increase in size and appear like drops of grease or thin mortar spattered over the skin, we have the *guttate form* of the disease; and when the patches assume the size and shape of silver coins they are often described as *nummular psoriasis*. By healing in the centre these lesions may be converted into scaly rings, or by peripheral increase and coalescence they may result in the formation of extensive scaly patches. Though the disease is not uncommonly met in children, diffused or general psoriasis is rarely met with among them. It is not generally so well developed and so extensive as it is apt to be in later years. The amount of scaliness present in any case depends upon the attention which the patient naturally devotes to his skin. As the eruption tends to disappear, the scaling grows less, often disappearing from the centre of the patch and leaving a marginate ring. Finally the redness fades and the skin assumes a normal appearance, except in certain cases, where pigmentation may occur. In rare cases of psoriasis the eruption may tend to rapidly involve the whole skin. The cutaneous congestion is severe, and large flakes of partly-detached epidermis may take the place of the silvery scales.

Psoriasis is usually seen upon the extensor surface of the extremities, and is especially apt to be noted about the elbows and knees. When upon the scalp the scaly patches are apt to be small, numerous, and circular, with healthy skin intervening. The eruption upon one extremity or on one side of the trunk is usually duplicated upon the other side (George Henry Fox).

Pruritus may or may not be complained of, and the patients may be in apparently good health. Disorders of

the muscles and joints are often noted, however.

Diagnosis.—Diagnosis of psoriasis, as a rule, presents no difficulties; the silvery-white, perfectly-dry scales are altogether characteristic. Upon the scalp it may be confounded with seborrhœa, but the absence of inflammatory reddening and the greasy character of the scales in the latter affection will serve to distinguish it from the former. (Hartzell.)

ECZEMA.—Whether occurring in small disks or in large, irregular patches, the border in psoriasis is always sharply defined, and never shades off gradually into the surrounding healthy skin, as does the ordinary patch of eczema. This is a diagnostic point of great importance. In many cases of eczema the patches may be dry and scaly and present a resemblance to those of psoriasis, but the rounded, silvery disks or larger marginate patches of the latter disease are usually so characteristic that an error in diagnosis is not likely to be made. While eczema may appear upon almost any part of the body, and often exhibits a tendency to attack the flexor aspect of the joints and other parts where the skin is thin and delicate, psoriasis, as stated, is generally seen upon the extensor surface of the extremities, and is especially apt to be noted about the elbows and knees. (George Henry Fox.)

SYPHILIS.—An eruption resembling psoriasis sometimes occurs in this disease, but the successive crops and the coalescence of lesions in psoriasis serve to distinguish it. (Cantrell.)

Etiology.—Psoriasis occurs somewhat more frequently in males than in females, and at all ages, but it is most frequently met with in subjects between 10 and 30 years of age, though it is by no means rare in infancy. It is essentially a chronic disease. Psoriasis is not

a local disorder, but depends upon a general condition, which repeatedly produces the eruption.

Psoriasis is dependent upon a blood-state closely allied to that belonging to gout and rheumatism; the uric-acid diathesis. Free indulgence in meat tends greatly to aggravate the eruption, whereas its restriction, especially the avoidance of beef and mutton, including meat-extracts and strong soups, materially aids in its removal. (L. Duncan Bulkley.)

Psoriasis of the palm is occasionally met with in cases of acquired syphilis, but usually this is observed, according to Hutchinson, in individuals whose hands are more or less irritated by friction.

Tendency to psoriasis is frequently inherited, and often the disease may be observed in two or more generations.

Seasons seem to have some influence upon the disease, since in spring and autumn the disease often takes on an increased vigor. Influences tending to lower the vitality seem also to play a part. Pregnancy and lactation are frequent causes of its extension; it frequently follows scarlet fever. If psoriasis already exists the latter disease may cause extension of the eruption.

The pathological lesion consists in an hypertrophy of the upper cutaneous layers, characterized by keratosis. The examination of 1500 sections taken from six untreated cases have led Munro (*Annales de Dermat. et de Syph.*, No. 11, '98) to conclude that the disease is not due, as hitherto supposed, to some vice of formation of the corneous epidermis, the abnormal keratinization being an essentially secondary lesion. The primitive lesions of psoriasis are miliary abscesses of the epidermis, situated almost upon the surface of the corneous layer, and around these miliary abscesses the

epidermic reaction produces an hyperkeratosis. No specific micro-organism was found. The disease is not contagious.

Literature of '96-'97-'98.

The predisposing element is an abnormal irritability of the central nervous system. The arthropathies in severe psoriasis are probably to be identified with neither rheumatism nor gout. These peculiar arthropathies variously observed in severe psoriasis are in great probability co-ordinate with psoriasis, and are to be traced to the same cause, viz.: a chronic condition of spinal irritation. Psoriasis can arise directly in connection with psychical affections. Kuznitzky (*Archiv f. Derm. u. Syph.*, B. 38, H. 3, '97).

Treatment.—The local treatment is of secondary importance, the disease being a manifestation of a general disorder. If a gouty diathesis be traceable, appropriate remedies are indicated (see GOUT). If the nervous system be at fault, remedies tending to increase their nutrition,—strychnine, for instance,—assisted by electricity, especially the static, are indicated. In other words, the general causative factor should be ascertained and appropriately treated. L. D. Bulkley has emphasized the fact that psoriasis is benefited by alkaline remedies, counteracting acidity of the blood and urine.

Jonathan Hutchinson states that in all cases of psoriasis alcoholic stimulants should be forbidden, and that those who persist in intemperance are incurable. He recommends an ointment containing chrysophanic acid, creasote, liquor carbonis, and ammonio-chloride of mercury, varying in proportion according to the delicacy of the skin; this must be used very freely, without regard to the underclothing or bed-linen. The regular use of a hot bath softens the skin and prepares it to receive the ointment.

Arsenic enjoys the confidence of some dermatologists, but, according to Fox, Crocker, and other authorities, it is not only useless, but in some cases it may be injurious. It fails entirely as a prophylactic, and usually local applications are preferable to its use. When the disease tends to improve, however, it may be of service in hastening recovery.

Psoriasis treated with 5-minim doses of oil of copaiba, with excellent results. J. A. Cantrell (*Ther. Gaz.*, June 15, '95).

Literature of '96-'97-'98.

Intravenous injections of arsenic employed in 28 cases of psoriasis, in 25 of which no other treatment was adopted. Of these 25, 10 were completely cured, 6 left the hospital much relieved, and 9 were reported as still under treatment, all greatly improved, and 3 nearly cured. The commencing dose is 1 milligramme of arsenous acid, and this is increased daily by 1 milligramme up to 15 milligrammes, the maximum dose, which is repeated daily until the eruption disappears, generally at the end of six or seven weeks. The following is method of procedure:—

After disinfection of the skin by soap, turpentine, ether, and sublimate, and the application of an Esmarch bandage above the elbow to render the veins prominent, the needle of a Pravaz syringe is introduced as nearly parallel to the skin as possible, and its penetration of the vein ascertained by withdrawing the piston. After the injection of 1 cubic centimetre of a limpid solution of arsenic of the desired strength, the wound is closed with oxide-of-zinc plaster. Herxheimer (*La Sem. Méd.*, '97; *Brit. Med. Jour.*, Oct. 23, '97).

Of the various local remedies employed chrysarobin stands without a rival. Like arsenic, it is most likely to do good when the acute congestion of the psoriatic patches has subsided and the eruption is tending toward a spontaneous improvement. It not only stains the skin temporarily, but it permanently discolors the underclothing and the bed-

linen, if due precaution is not taken. When rubbed in where the skin is thin, or near it, it often excites a very unpleasant dermatitis for a few days; and when by chance a little of the ointment gets into the eye a very severe conjunctivitis often results. Upon the trunk and extremities a 5- or 10-per-cent. ointment, made by rubbing up a finely-sifted chrysarobin in vaselin, can be advantageously used; but upon the scalp and face the ointment of ammoniated mercury will generally prove efficacious, and is to be preferred to the chrysarobin. George H. Fox (*Amer. Jour. Obstet.*, Apr., '96).

For the scalp, if there is much inflammation, the local treatment may be begun with ammoniated-mercury ointment, 5 grains to the ounce, the strength being increased by degrees. Sulphur and salicylic acid are of great value, more suitable when the irritation is not so severe. They should be used from 10 to 30 grains to the ounce, either together or separately. For psoriasis, involving the general surface, bathing in warm water is well spoken of, followed (where the patches are few and not inflamed) by chrysarobin in liquor guttæ perchæ or tar in collodion, 20 grains to the ounce. Unna's compound chrysarobin ointment is valuable and consists of: chrysarobin, 5 parts; salicylic acid, 2 parts; ichthyol, 3 parts; petrolatum, 90 parts. Arsenic, potassium iodide, sodium salicylate, and thyroid gland internally are useful. The last named should be used with caution. Norman Walker (*Quar. Med. Jour.*, July, '97).

Formula for ointment to be employed in very obstinate cases of psoriasis is:—

R Acid. salicylic, 3 parts.
Acid. pyrogallæ, 3 parts.
Ammon. sulpho-ichthyol, 3 parts.
Olei olivæ, 10 parts.
Adip. lanæ, to 100 parts.

Paul Richter (*Monats. f. prakt. Derm.*, p. 342, Oct. 1, '98).

The use of thyroid tabloids in psoriasis has been disappointing; nevertheless, great improvement has been noted in

certain cases. (See *ANIMAL EXTRACTS*, volume i.)

As to the prognosis, George Henry Fox states that it is often an easy matter to remove the eruption by treatment, but it is difficult, if not impossible, in many cases, to prevent its speedy return. The prognosis, therefore, is always unfavorable as regards the permanent cure of the disease.

PTOSIS. See *PALPEBRÆ*.

PUERPERAL ECLAMPSIA AND FEVER. See *ECLAMPSIA*.

PULMONARY ABSCESS AND GANGRENE.

Pulmonary Abscess.

Although abscess of the lung is almost always associated with pulmonary tuberculosis, it may also be the result of other local or neighboring pathological processes and injuries. Hence its consideration here.

Mechanical injuries, such as fractured ribs and penetrating wounds, may cause abscess of the lung, especially in cases in which the vitality is below normal. This variety, however, will be considered under *THORAX ORGANS, INJURIES OF*.

Symptoms.—When, in the course of pyæmia or any other infectious disease in which the lungs are not primarily involved, localized distress in one or both lungs, shortness of breath, etc., and a rise in temperature appear, abscess of the lung is a possibility. It can only be verified, however, by the presence of pus in the sputa. These are usually yellowish green and emit an offensive odor, though less so than in gangrene. At times they assume a reddish or brownish tinge and contain shreds of tissue which, microscopically examined, often prove to be elastic fibres. Blood-corpuscles, alveolar epithelium, crystals of margaric, chole-

sterin mold-fungi, and various bacteria, according to the causative malady, may also be found in the secretions.

In abscess occurring as complication of acute pneumonia there is an intermittent rise in the temperature, usually about the time of the crisis; and marked prostration appears. At first physical examination affords but little information, though the signs of consolidation persist. When an abscess of large size opens into the bronchi, however, the signs of a cavity as witnessed in tuberculosis present themselves. The history of the case and the presence of the cavity afford opportunity for a certain diagnosis.

Simple abscess of the lungs is liable to be met with in one of four forms: The first is that in which the symptoms are very obscure from the beginning, and remain so until there suddenly occurs a discharge of purulent matter. In the second form the symptoms resemble those of pleurisy with effusion, and in the third those of pulmonary tuberculosis. The fourth is that associated with the variety of pneumonia which advances slowly from one lobule to another, or is characterized by a tendency to skip from one lung to the other. S. Seabury Jones (*Med. News*, Mar. 2, '89).

Literature of '96-'97-'98.

Local tenderness is an important sign of abscess of the lung. C. F. Withington (*Boston Med. and Surg. Jour.*, Mar. 10, '98).

Etiology.—Acute pneumonia is the disease in the course of which pulmonary abscess most frequently occurs next to pulmonary tuberculosis, but, at best, even here it is not a frequent complication. Septicæmia or pyæmia may also be accompanied by abscess of the lung through infectious emboli. It is especially liable to occur in persons in whom the general health had been poor before the onset of the causative affection, and in lymphatic or alcoholic subjects.

In some forms of broncho-pneumonia it is said to be frequently observed. It occasionally presents itself as a complication of abscesses in neighboring structures, the liver particularly, the pleural cavity, and of tumors and cysts.

Pathology.—The local lesions are merely those of an ordinary abscess, containing micro-organisms, these varying, as stated, with the nature of the causative disease. Streptococci and the diplococcus pneumoniae among others have been observed. The size of the abscess may vary greatly from that of a chestnut to that of a large orange. An abscess of long duration shows a limiting peripheral membrane, and closed abscesses considerable cicatricial tissue: a clear indication of the tendency to resolution of these abscesses if the general health can be improved.

Pulmonary abscesses may rupture into the pleura, the pericardium, and peritoneum.

Prognosis.—The prognosis of pulmonary abscess other than that due to tuberculosis has somewhat improved since paracentesis has been introduced. In abscess complicating pneumonia the prognosis is not as unfavorable as would logically appear. The prognosis becomes very unfavorable, however, when pulmonary abscess occurs as complications of abscesses elsewhere.

Treatment.—In cases other than tuberculous ones, the abscess, when the diagnosis is certain, should be evacuated by aspiration or incision. It will not only tend to prevent rupture into the neighboring cavities, but counteract the tendency to mortal marasmus which an untreated abscess involves.

Literature of '96-'97-'98.

The results of operations for pulmonary abscess are full of promise. Fabri-

cant reports 38 cases, with 29 recoveries and 9 deaths. Réclus reports, out of 23 operations which have been performed within the past ten years, 20 cures and 3 deaths. The old idea that adhesions between the lung and parietal pleura were a requisite for successful operation is passing into oblivion. Adhesions are unquestionably of great advantage. If adhesions are absent the operations can be carried out in two stages; at the first, suturing the two pleural layers; at the second, opening the abscess after a delay of a few days. Unfortunately, however, such delay is generally inadmissible—it means death. The abscess must be opened at once. In certain cases the parietal pleura may be sutured to the lung, but generally the patient's condition is such that the operation must be rapidly completed, the pleural cavity being protected as well as possible by sponges and gauze. Editorial (Medical News, Feb. 13, '97).

Two cases of successful operation for abscess of the lung. In one case the clinical signs were those of an empyema, but at the operation it was found that the pleural cavity was free from pus, and an exploration of the lung-tissue discovered a circumscribed abscess. The operations were attended with a considerable hæmorrhage; but this was easily controlled by packing. Riedel (Münch. med. Woch., July 12, '98).

The measures recommended under FŒTID BRONCHITIS (*q. v.*) are all indicated here. Simultaneously and in addition to the measures employed to counteract the causative disease, remedies and food calculated to increase the strength of the patient greatly enhance the chances of recovery.

Pulmonary Gangrene.

Gangrene—*i.e.*, death and putrefaction of a more or less extensive area of the lung-tissue—occurs occasionally as a complication of pulmonary or infectious diseases.

Symptoms.—These vary according to the characters of the causative affection

and the region involved, but, as a rule, intense fœtor of the expectoration and of the breath is the first indication that a necrotic process has begun. This peculiar fœtor may be said to be pathognomonic; it contaminates the patient's surroundings, and renders his presence almost unbearable where other patients are gathered, and isolation becomes necessary. It is far more offensive than in pulmonary abscess or bronchiectasis.

When the sputum is allowed to accumulate in a glass dish it separates into three layers: a superficial layer, which is frothy, yellowish gray; a middle layer, almost transparent and resembling pure serum; and a lower, a foul, greenish mass, streaked with blood in proportion as the vascular elements are involved in the destructive process. The mass contains various bacteria, pieces of small bronchi, fat-globules, pus-cells, and fungi, etc., and sometimes portions of lung-tissue.

The general manifestations are mainly those of the marasmus of pyæmia: great prostration, emaciation, weakness. Fever is, moreover, less marked and irregular and attended with chills and profuse sweating. Exhausting coughing spells tend to increase the patient's discomfort. Two forms are recognized: the diffuse and circumscribed.

DIFFUSE PULMONARY GANGRENE is usually, though rarely, met with in lobar pneumonia as a result of pressure upon or occlusion of a large arterial trunk, especially the pulmonary artery. The lung, no longer supplied with blood, is transformed into a necrotic mass. The general symptoms are intense in proportion and death soon ensues.

CIRCUMSCRIBED PULMONARY GANGRENE.—As the name implies, this form of necrosis occurs in circumscribed portions of either lung. Occlusion of the arterial supply is also the causative fac-

tor here, but the difference is that a limited number of small vessels are occluded instead of a large trunk as in the diffuse form. An area, thus deprived of its blood, is, as a rule, clearly defined; several such may exist in the same lung. The gangrenous foci may gradually extend, but the normal effort of Nature is to create a limiting wall of connecting tissue. Sudden intense pleurisy or pyopneumothorax may suddenly appear from penetration of the abscess into the pleura. Bronchitis, catarrhal and croupous, may also be developed in this way.

The physical signs of circumscribed gangrene are generally quite obscure unless the necrotic process be near the surface, when, during the stage of consolidation, dullness may be elicited under percussion. Later on, when the tissues have broken down, the evidences of a cavity may present themselves—cracked-pot resonance—besides those of the causative affection. In large cavities cavernous and bronchial râles may also be discerned.

Diagnosis.—The diseases from which gangrene must be differentiated are abscess and putrid bronchitis.

PULMONARY ABSCESS.—In this disease the fœtor of the breath is not excessive; that of gangrene is such as to at once be recognized by its intense foulness and persistence. The division of the sputum into three parts presenting the characteristics noted is peculiar to gangrene.

PUTRID BRONCHITIS.—In this disease the odor resembles somewhat that of acacia-blossoms. The sputum does not contain disintegrated lung-tissue and is less dense. A history of bronchitis can usually be obtained, and the marasmus attending gangrene is not present. In early cases, however, the distinction can

only be based upon the odor of the breath and expectoration.

Etiology.—Almost any pulmonary disorder may be followed by gangrene when the nutrition of parenchyma or its continuity have become impaired. In the latter case the bacteria of putrefaction, the staphylococcus albus or aureus, are the active etiological factors. It may occur as a complication of phthisis, pneumonia, influenza, bronchiectasis, wounds, contusions, variola, measles, typhus, etc. In children it sometimes presents itself as a sequel of cancrum oris.

Literature of '96-'97-'98.

Case of gangrene of the lung that followed an attack of uræmia. The breath was offensive, sputum dark, and there were frequent hæmorrhages of varying amounts. There were moderate fever and emaciation. The physical signs consisted of restricted respiratory movements and increased percussion-dullness over the apex of the left lung, including râles and bronchial breathing. The symptoms improved, only to recur for several months. Permanent recovery finally ensued. A. McPhedran (Amer. Med.-Surg. Bull., Aug. 29, '96).

Compression by tumors or aneurisms may occlude the arteries and arrest nutrition of the lung, while emboli due to the introduction of putrid substances may cause it by arresting the flow of blood through the smaller vessels. Circumscribed gangrene of this kind is often accompanied by cerebral abscess, through migration to the brain of a detached fragment of embolus, which in turn arrests the circulation in the cerebral region involved. Detached thrombi may also start a gangrenoid process in other parts of the lung. Gangrene may also be started by the penetration of foreign bodies, food, etc., into the bronchi, the bacteria of putrefaction entering simultaneously. It is more likely to

occur in persons weakened by various diseases, or any habit tending to weaken the organism. Diabetes mellitus and alcoholism may thus predispose to gangrene.

Pathology.—The circumscribed areas are blackish or greenish, presenting ragged edges. The lung around the foci is inflamed, and the air-spaces contain epithelium, fibrin, and pus. Once formed, they may increase in size, the adjoining veins becoming filled with infectious thrombi. Portions of the latter may be carried into the circulation and set up inflammatory foci in various parts of the body. The vessels may also be eroded and thus be the source of copious hæmorrhage. If the patient recovers, the gangrenous portion of the lungs is entirely removed and a cavity is formed, the walls of which are changed into connective tissue. It may remain in this condition for a long time or become contracted. (Delafield.)

Literature of '96-'97-'98.

Pulmonary gangrene due to perforation of the œsophagus is rarely seen, and is almost always fatal. Case observed by writer terminated favorably. Schroeder (Centralb. f. inn. Med., Jan. 15, '98).

Case of a woman under treatment for diarrhœa and emaciation. Bothriocephalus-eggs were found in the stools and three worms were expelled by treatment. The symptoms persisted. Signs of infiltration of the lower lobe of the right lung appeared, bacilli staining by the usual methods for tubercle bacilli were found in the sputum, and the diagnosis was changed to tuberculosis of the lungs and intestine. Three days after the discovery of the pulmonary dullness the patient died. Autopsy showed bronchiectasis, small gangrenous abscesses of the lung, and ulcerative enterocolitis. Examinations showed the complete absence of tuberculous lesions and proved that the bacilli belonged to the group of

smegma bacilli. Pappenheim (Berl. klin. Woch., No. 37, '98).

Prognosis.—The prognosis of diffuse gangrene is obviously of the gravest kind. In circumscribed gangrene, however, the case is difficult if the affected areas are not restricted, the greatest danger being exhaustion and fatal hæmorrhages. The latter may cause death when recovery seems assured. The prognosis is rendered far more favorable, however, if surgical measures are resorted to.

Treatment.—The most important features in the treatment of gangrene are to enhance the strength of the patient by nutritious diet, to administer remedies that tend to encourage the separative process and disinfect the necrotic foci. The first requisite is best satisfied by liquid concentrated food, administered in fixed quantities at regular intervals, the patient being encouraged to eat by catering to his tastes. Before partaking of food, however, he should carefully wash his mouth with some antiseptic solution devoid of taste. A solution of borax best answers the purpose, it serves as a good mouth-wash and as an efficient gargle. Alcoholic beverages should be avoided, they tend to increase the chances of hæmorrhage by stimulating the heart. The separative process may be encouraged by the administration of creasote in gradually-increased doses and aided by the inunctions of iodoform, or, better still, euophen-oil, as recommended by Flick in the treatment of tuberculosis. (See PULMONARY TUBERCULOSIS, TREATMENT.)

Antiseptic solutions may also be administered in the form of spray. The most active disinfectant is a solution of permanganate of potassium 1 grain to the ounce, the patient taking deep

breaths to inhale the spray. A saturated solution of chlorate of potassium is more agreeable, but less effective. Yeo's respirator (a wire-gauze funnel-like instrument) may be used constantly by the patient to inhale terebene or turpentine, which tend greatly to modify the horrible fœtor with which the patient is surrounded, while favorably influencing the diseased areas if these are reached.

SURGICAL MEASURES.—Among the surgical measures, pneumonotomy, or simple incision into the lung, is the preferable operation. It is indicated, according to Réclus, when the cavity, though distinctly circumscribed, is large, and when there are evidences of toxæmia through retained putrid contents.

Case of a man treated surgically for gangrene of the lung. An incision being made in the left second intercostal space, the lung-tissue covered by pleura was seized with a pair of forceps. The pleura and the lung were then successively incised, about two centimetres of lung having to be traversed before the purulent cavity, which had a capacity of 2 fluidounces, was reached. The cavity was carefully disinfected, its parietes washed with camphorated naphthol, and finally two large drainage-tubes secured in it by suturing on each side. All coughs, expectoration, and morbid physical signs disappeared. Périer (*Lancet*, Apr. 2, '92).

Pneumonotomy performed in a case of gangrene of the lung in which the expectoration had been abundant and fœtid for two years. The wound healed in three weeks. Podreze (*Revue Gén. de Clin. et de Thér.*, Nov. 16, '95).

The fears formerly entertained that collapse of the lung would follow penetration from the surface have been allayed by modern experimentation, and small portions of the lung have been removed without untoward results, recovery following in the majority of cases.

Pneumonotomy consists in making a free incision down to the pleura, resecting one or more ribs if needed. The cautery-knife is then used to penetrate the pulmonary cavity. When the lung is adherent to the chest-wall, this step of the operation is easy. When, however, it is not, the majority of surgeons prefer to elevate the portion of lung overlaying the cavity and to fasten it to the external wound by a row of sutures. Adhesion taking place in a few hours, the cautery may then be used to open the gangrenous focus. Success, however, has also followed incision through pulmonary tissue.

Literature of '96-'97-'98.

In gangrene the mortality without operation is about 80 per cent. In certain cases of diffuse gangrene operation is out of the question, and the case is hopeless. In circumscribed gangrene operation offers to the patient a fair chance of recovery.

The operation, if otherwise indicated, should be performed, adhesions or no adhesions.

Heydweiller collected 40 cases treated by operation prior to 1892, with 22 recoveries, 4 improvements, and 14 deaths. The more recent cases of Réclus number 14 operations, 11 of the patients being cured, 1 being improved, and only 2 having died. Editorial (Med. News, Feb. 13, '97).

The cavity is carefully emptied of its contents, gently relieved of all *detritus*, disinfected, and drained.

Literature of '96-'97-'98.

In establishing free drainage in cases of gangrene, it is of the first importance to have a soft tube of suitable and measured length, so as to avoid irritation, coughing, and erosion of the larger blood-vessels. The putrid expectoration and fever should diminish or cease soon after the operation. In 55 cases of gangrene following pneumonia recovery took place

in 39; in 4 cases following bronchiectasis only 1 recovered; in 7 embolic cases only 2 recovered. Tuffier (La Sem. Méd., Aug. 21, '97).

Pneumonec-tomy, or exsection of a portion of the pulmonary tissue, formerly failed, according to Delagénère, because surgeons were content merely to drain the gangrenous focus, instead of extirpating it as completely as possible. The pleura should be opened very freely at the side by an L-shaped or U-shaped incision, or behind by a vertical one, according to circumstances. The operator should not hesitate to resect sound ribs, if necessary. The operation is concluded in the same manner as the latter, by drainage. Strict antisepsis is an all-important element of success.

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PULMONARY CIRCULATION, DISORDERS OF.

Pulmonary Atelectasis.

Definition.—Atelectasis is a congenital or acquired inability to adequately expand all the pulmonary air-cells, and resulting in imperfect oxygenation of the blood.

Symptoms.—The symptoms depend upon the degree of involvement of the respiratory tract. If but a few lobules are collapsed, compensatory action of other parts of the lung annuls the deficiency. If, however, the portions involved compromise about one-eighth of the respiratory capacity, there is dyspnoea and imperfect oxygenation.

In the CONGENITAL form the infant is born with its skin and mucous membrane cyanosed, thus constituting what is popularly termed a "blue baby." It may be born dead or dying from asphyxia. If the atelectasis is only partial, the infant will present symptoms varying in inten-

sity with the area involved: shallow, rapid breathing; cold extremities, drowsiness, spasmodic movements, and convulsions. Instead of crying lustily, it gives forth a plaintive whine, the chest does not expand, the intercostal spaces are depressed, and examination reveals absence of fremitus in the undilated pulmonary region. If the child continue in this condition, local complications of an inflammatory kind are likely to occur.

Diagnosis.—Atelectasis is to be mainly differentiated from pulmonary embolism, pneumonia, and pleurisy.

PULMONARY EMBOLISM.—In this disorder there is pain, bloody expectoration, and evidences of a febrile process that does not exist in atelectasis.

PNEUMONIA.—In the croupous form there is marked crepitus and high fever following chill. There is also pain.

PLEURISY.—In this affection fever is also present; friction-sounds may be heard; percussion shows circumscribed area of dullness, shifting when the patient's position is changed.

Etiology.—Congenital atelectasis is mainly the result of pulmonary expansion due to incompetence of the respiratory centre of the infant. But this, in turn, may be the result of improper oxygenation of the blood and reabsorption of carbonic acid through pressure upon the umbilical cord. This may result from twisted cord or through constriction, especially during protracted labor. When the respiratory centre is called upon at birth to initiate pulmonary respiration, the impetus fails or is not given. Premature birth may also be accompanied by atelectasis through insufficient development of the respiratory centre.

Atelectasis may be caused by malformations and intra-uterine diseases of the organs of respiration or circulation, or it may be due to hæmorrhage with press-

ure upon the respiratory centre, or to the premature and feeble condition of the infant. Acquired atelectasis may be due to penetration into the bronchial tubes of viscid mucus or of some of the products of intra-uterine life. A. Jacobi (*Arch. of Ped.*, Jan., Dec., '88).

ACQUIRED atelectasis usually occurs as the result of a condition involving reduction of the lumen of the respiratory tract. Foreign bodies may thus cause atelectasis by preventing the ingress of air, while the residual air is gradually eliminated by contractions of the thoracic walls and diaphragm, or absorbed. False membrane, meconium, muco-purulent masses, blood, etc., have thus brought on this distressing condition. Processes that interfere with expansion of the chest by pressing on the lung—spinal curvature and other diseases of the bony frame-work, tumors, effusions into the pleural or pericardial cavities, aneurism, etc.—may also bring on atelectasis.

Literature of '96-'97-'98.

Case of pulmonary atelectasis of great extent, the normal resonance being replaced by flatness over the whole of the left lung and the respiratory murmur being weak, while the heart was dislocated to the left by the distended right lung. At the autopsy the left bronchus was found contracted and the lung collapsed and sclerotic. There was slight pigmentation of the left lung; this suggested that the organ once functionated and that early in life the bronchus was constricted and the lung collapsed. It was thought to be probably of specific origin. Rohmer and Borchert (*Deut. Arch. f. klin. Med.*, Dec. 22, '97).

Pathology.—The atelectatic areas—though hepatized, “carnified,” or firm—do not show histological change, barring, perhaps, slight dilatation of the vascular supply. The collapsed cavities, whatever be their size, can always be inflated with a blow-pipe, as shown by Legendre and

Bailey. The affected parts sink in water and are resistant under section. When causative disorders are present, the post-mortem evidences vary accordingly.

Collapse of the lobules sometimes occurs as a complication of capillary bronchitis. Pertussis and wide-spread broncho-pneumonia may also occur as causes.

Prognosis.—The prognosis varies according to the extent of the area involved. When small areas are atelectatic, recovery is usual, but extensive reduction of the respiratory capacity is seldom recovered from. In premature births the chances are greatly against the infant. The same is the case when atelectasis is the result of some pulmonary disorder.

COMPLICATIONS.—Pulmonary tuberculosis, pleurisy, and broncho-pneumonia are frequently observed in these cases and greatly compromise the issue. When atelectasis is due to pressure,—*i.e.*, occurs as the result of effusions into the pleura, aneurism, tumors, etc.,—the prognosis is very unfavorable. Emphysema sometimes presents itself in atelectatic infants, but as a compensating factor, its presence increasing the respiratory area.

Treatment.—The important indication in this disorder is to increase as much as possible the vital activity of the patient. Gentle massage under warm bedclothes, the friction being always in the direction of the heart, tends greatly to increase the activity of the circulation. Laborde's method of rhythmical traction of the tongue is said to be valuable. Oxygen inhalations would seem to be indicated, though care should be taken to avoid overstimulation, lest pulmonary hyperæmia follow. Pure air is essential in such cases. A little brandy, a few drops in sugar and water, given from time to time, is generally recommended. Tonics—strychnine, especially—are of value. Nutritious, though easily-digested, food,

when the child is old enough, is of great importance as a curative factor to antagonize the vital adynamia that lies back of the trouble.

Inversion of the child preferred to establish respiration, the child lying upon the back, head downward, upon the forearm of the operator, whose fingers are hooked into its shoulders. The arms of the child fall downward as the hands of the operator are depressed, and the chest is thus dilated. The pressure being then suddenly removed a respiration takes place. Such a movement also favors the removal of mucus from the air-passages. Reynolds (Archiv f. Kinderh., B. 11, H. 1, '88).

Harvey L. Byrd's method of artificial respiration advocated. The physician places his hands under the middle portion of the child's back, with their ulnar borders in contact and at right angles to the spine. With the thumbs extended, the two extremities of the trunk are carried forward by gentle, but firm, pressure, so that they form an angle of 45 degrees with each other in the diaphragmatic region. Then the angle is reversed by carrying backward the shoulders and the nates. E. L. Crutchfield (Med. Bull., Sept., '92).

Following method of resuscitation advocated. The infant is grasped with the left hand, the neck resting between the thumb and forefinger (Fig. 1), the head falling far backward. The upper portion of the back and scapulæ will rest in the palm of the hand, the other three fingers being inserted in the left axilla, raising it upward and outward. Next, the knees are grasped (Fig. 2) so that the right one will rest between the thumb and forefinger, the left between the forefinger and middle finger. The back of the thighs will rest in the palm of the operator's hand. Next, the pelvis and lower extremities are depressed (Fig. 3), while the left hand gently bends the dorsal region of the spine backward. To excite expiration the movement should be reversed, the head, shoulders, and chest being brought forward and the ribs closed upon each other. At the same moment the thighs

are brought forward and rested upon the abdomen. Dew (Med. Record, Mar. 11, '93).

Method of tongue-traction recommended in asphyxia neonatorum. The infant is placed upon its side or abdomen, the thumb of the left hand of the operator resting under the chin, the index finger upon the root of the tongue, while the right hand is placed upon the chest. The tongue and chin are then drawn forward, the chest being alternately compressed. Amende (Med. Rec., Aug. 19, '93).

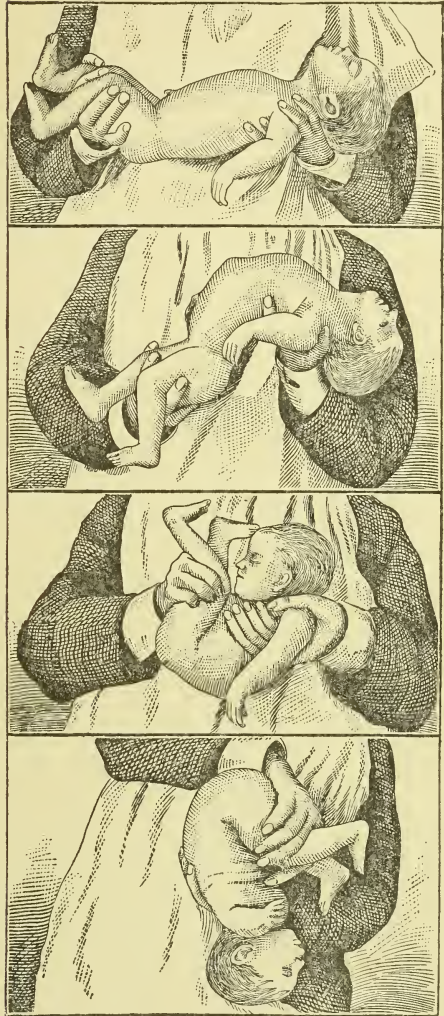
In asphyxia of the newborn mouth-to-mouth inflation favored, the infant's nostrils being closed and a moderate degree of pressure used at first to prevent forcing the epiglottis over the larynx. This is a better method than inflation with a catheter, since most of the air introduced by this instrument returns at its side. O'Dwyer (N. Y. Med. Jour., Mar. 9, '88).

Failure to relieve asphyxia is due to obstruction of the glottis by the backward pressure of the tongue; the tongue should be well drawn forward. Air can then be readily forced into the infant's lungs either by direct application of the accoucheur's lips to the lips of the child or by passing a soft catheter into the child's trachea. This will usually be sufficient for blue or cyanotic infants; for the pale and collapsed ones, pressure over the cardiac region, rapidly and rhythmically, to imitate the normal heart-beat, must also be used. Oehlschläger (Amer. Jour. Med. Sci., Apr., '94).

Success of the Laborde method—rhythmical traction of the tongue eighteen times a minute—is due to reflex irritation, which is referred to the respiratory centre through the motions of the base of the tongue. Cameron (Jour. Nerv. and Mental Dis., June, '95).

In using Ribemont's tubes the infant should be wrapped in warm clothes and laid on a table, its shoulders raised by a folded towel under them. The left index finger should be passed into the pharynx till it reaches the arytenoids. The tube is then to be passed along the palmar surface of the finger, and thus

guided into the glottis. Its position should then be tested as follows: 1. The finger, passed along the posterior surface of the tube, is in contact with the smooth metal until it reaches the posterior edge of the larynx. 2. On ro-



Method of resuscitation. (Dew.)

tation of the handle of the tube the larynx is also rotated. 3. If, on blowing into the tube, there is no noise, but inflation of the chest, the position is correct. If the tube is in the œsophagus there will be a gurgle and the abdomen will become distended. 4. When the

lungs have been inflated their elasticity expels the air with a murmur. No such escape of air attends inflation of the abdomen. Budin saved three children by this method when all others had failed, plugs of mucus being aspirated from the trachea. Reynolds (Boston Med. and Surg. Jour., Aug. 2, '94).

Following procedure is an improvement over the Schultze method. The child is laid upon a table, its neck supported by a roll. The feet are so seized that the thumbs are in contact with the child's soles, the index finger with the back of the feet, the ring-finger resting upon the tendo Achillis. The remaining fingers are closed. The knees, hips, and spine are then bent in regular motions, the knees touching the breast. Compression of the abdomen, with expiration, results; then, by stretching out the body, inspiration follows. The larynx is not compressed, as may be the case by the Schultze method. As an alternative measure, the suspension of the child by the legs is suggested. At the same time the finger may be passed down the throat to facilitate the removal of fluids, provoke vomiting, and thus compress the lungs. Such a method tends to prevent aspiration pneumonia. Rosenthal (Univ. Med. Mag., Apr., '95).

Pulmonary Congestion.

Congestion of the lungs typifies that observed elsewhere in the organism, and may, therefore, be divided into two classes: active and passive.

Active Pulmonary Congestion.—

SYMPTOMS.—The symptoms vary with the intensity of the congestion and the amount of lung-tissue involved. Dyspnoea, cough, frothy expectoration, localized pain, wheezing, and accelerated breathing are usually observed; occasionally the expectoration is tinged with blood. In rare cases there is active pulmonary hæmorrhage, followed by death (Devergie). All these symptoms, according to Ball, may be found in pulmonary congestion of malarial and gouty origin. Death may also occur as the re-

sult of asphyxia, brought on by the mechanical blocking of the tubes by excess of secretion (Musgrave). The temperature rarely surpasses 100° F., and the pulse is tense and bounding. In favorable cases defervescence usually begins twenty-four to thirty-six hours after the onset of the active symptoms.

Both lungs are usually involved, and in mild cases the hyperæmia gives rise to appreciable signs only at the base. Fine fremitus may be detected; the breath-sounds are unusually audible, the expiration being prolonged and harsh. Moist subcrepitant râles attend the more severe cases, but these are also most evident toward the bases.

ETIOLOGY AND PATHOLOGY.—Active congestion may occur as a primary disorder, especially in persons in whom the kidneys are diseased. Exposure to damp and cold air while the surface is warm, as is the case during bicycle-riding, or prolonged bathing in cold water, may under these conditions bring on pulmonary hyperæmia, which in rare cases assumes a grave form. In the vast majority of cases, however, pulmonary active congestion is due—not to speak of the conditions such as pneumonia, pleurisy, bronchitis, etc., of which it forms an early stage—to the inhalation of steam, hot air, and other irritating factors. It has also followed violent emotions or fright. In the latter case paresis of the vasomotors is probably the most important pathological feature. Congestion of the mucous membrane and the presence of bloody and frothy mucus constitute about all the morbid conditions found post-mortem.

TREATMENT.—In cases due to exposure, dry cups, mustard foot-baths and opium internally, followed by a saline purgative, usually suffice to overcome the hyperæmia. In cases brought on by

irritants—steam, hot air, acid fumes, etc.—the bromides in large doses are very effective. When the dyspnoea is severe, however, venesection is indicated, especially if the patient be large and plethoric: a class of individuals in which active congestion is apt to occur. Wet cups should be used if venesection cannot be resorted to. Tincture of veratrum viride or of aconite in small, but frequently-repeated, doses, and closely watched, will then prove effective in maintaining the pulmonary circulation at its normal level.

Passive Pulmonary Congestion.—The passive form is generally due to cardiac diseases, especially those in which the mitral and tricuspid valves are involved, and when dilatation and fatty degeneration are present. It may also occur as a complication of cerebral lesions and as a result of asphyxia. Tumors may also give rise to passive congestion by pressing upon a large venous trunk.

SYMPTOMS.—The symptoms of this condition do not vary greatly from those of active congestion, but they do not appear suddenly, the progress of the pulmonary disorder depending upon that of the causative affection. In heart disease, for instance, the dyspnoea only appears when compensation begins to fail. In pulmonary tumor active symptoms only occur when the pressure of the neoplasm is sufficient to cause a degree of vascular stenosis for which collateral circulation cannot compensate. Cough and the expectoration of frothy and blood-stained serum, which upon examination is found to contain pigmented alveolar epithelial cells, constitute the characteristic signs of this form of hyperæmia.

ETIOLOGY AND PATHOLOGY.—The congestion being due to mechanical impediment to the flow of blood through

the vessels, the latter are distended and the whole lung is enlarged. The vascular engorgement causes the pulmonary tissue to become erect, firm, and resisting. When cut, it appears reddish brown; hence the name “brown induration” often given to this condition. There is marked increase of the connective-tissue elements and distension of the smaller vessels and alveolar capillaries. The alveolar walls are filled with cells containing altered blood-pigment, while their cavity contains epithelial cells in various stages of metamorphosis.

TREATMENT.—The treatment is obviously that of the causative disorder, but the condition may be greatly relieved by venesection. In desperate cases aspiration of the right auricle may be tried.

Hypostatic Congestion.—This is a form of passive congestion in which the blood accumulates in the posterior and inferior portion of one or both lungs, as a result of great prostration and debility.

SYMPTOMS.—As noted by Piorry, hypostatic congestion may be suspected when old and debilitated patients, contrary to their custom, sleep with opened mouth. This suspicion becomes confirmed when slight cyanosis indicates that proper oxygenation of the blood is not taking place. (Edema of the lower extremities is observed late in the history of the disease. In a large proportion of the cases, however, these characteristic symptoms are not detectable, and the diagnosis has to be based upon the physical symptoms. Slight dullness at the base of the lungs, feebleness of the respiratory murmur, and moist râles are the most marked of these, and suggest the presence of hypostatic congestion when other active symptoms attending inflammatory disorders of the lung are not present.

ETIOLOGY AND PATHOLOGY.—This

form of congestion is generally observed in elderly people who are obliged, through disease, to remain a long while in the dorsal position. The shoulders being raised by the pillows, the blood normally accumulates in the bases. Chronic diseases, long-continued fevers, and cardiac disease attended by weakness of the heart-muscle may thus favor the development of the disease. Fractured limbs in the aged may also prove indirectly causative if the patient is allowed to remain in bed beyond a certain time. The lesions resemble those of a mild lobular pneumonia. The capillaries are enlarged, the air-cells more or less collapsed, and the lung-tissue is dark red, dense, and engorged with blood and serum: a condition which has been termed "splenization."

TREATMENT.—The prevention of hypostatic congestion should be an important feature of the measures adopted in cases of paralysis, protracted tuberculosis, cancer, fracture, typhoid fever, etc., especially when these occur in old subjects. The posture should be frequently changed, not only from side to side, but also in respect to the elevation of the shoulders. The semiprone position—the patient lying with one side of his abdomen touching the bed—is a useful one to prevent or relieve the local engorgement, but he should be allowed to leave his bed as soon as at all practicable. It is important to sustain cardiac action; this may best be done by means of strychnine, nitroglycerin, caffeine, or digitalis.

Pulmonary Hæmorrhage.

Pulmonary hæmorrhage or bleeding within the lungs may be caused by various disorders and injuries, and erosion or rupture of the walls of the pulmonary vessels, large or small. It may be most conveniently divided into two forms:

the *broncho-pulmonary* (bronchorrhagia), in which the blood flows into the bronchi and is eliminated through the mouth—constituting hæmoptysis; and *pulmonary apoplexy* (pneumorrhagia), in which the blood accumulates in the pulmonary parenchyma, or the lung-tissue and the air-cells.

Broncho-pulmonary Hæmorrhage.—

Although this form of hæmorrhage is one of the prominent symptoms of pulmonary tuberculosis, it is important to realize that the latter affection is by no means the only one in which hæmoptysis may occur. It is a comparatively frequent accompaniment of cardiac disorders, diseases of the nasal cavities, pharynx, larynx, and trachea; aneurism; menstruation; arthritism; purpura hæmorrhagica; hæmophilia; the *Distomum pulmonale*, and other disorders.

Symptoms and Diagnosis.—In rare cases the quantity of blood is so great that the flow occurs from the nose and the mouth simultaneously. Again, it may be swallowed as rapidly as it reaches the laryngeal aperture, enter the stomach, and be regurgitated. But, in the majority of cases, the flow is not great; the patient first experiences a warm, salty taste, then ejects more or less great quantities of bright-red frothy blood. It may be brought up with a cough, or suddenly fill the mouth and be expectorated. Small quantities may be brought up from time to time and merely permeate the saliva with films or streaks. The first hæmoptysis may prove to be the last; it may recur a few hours later or the next day. When repeated hæmorrhages occur, the last sputa assume a dark aspect; this represents blood which has sojourned in the bronchi, and usually indicates an early cessation. Dyspnoea and a sensation of heat in the chest are sometimes complained of. If the

hæmorrhage is great, unconsciousness may occur.

Besides pulmonary tuberculosis (see TUBERCULOSIS), of which pulmonary hæmorrhage is one of the prominent earlier symptoms, and the diseases such as purpura hæmorrhagica, hæmophilia, scurvy, malignant infectious diseases, hepatic cirrhosis, etc., that are often attended by this symptom, hæmoptysis may occur in the following disorders:—

Cardiac Disorders.—Hæmoptysis frequently occurs when valvular disorders involving stenosis are present, and especially when the mitral and aortic valves are diseased. Besides the general symptoms of the cardiac affection, the character of the blood assists in establishing the diagnosis. Instead of being bright red and frothy, as in tuberculosis, it is, as a rule, dark and more or less mixed with mucus. It does not present itself in the mouth in sudden jets, but usually comes up as would muco-purulent sputa. Again, the sanguineous expectoration continues several weeks, sometimes without causing untoward symptoms.

Menstruation.—Hæmoptysis sometimes replaces menstruation in women. The hæmorrhages are then periodical; or they may be observed as a sequel to the menopause and occur repeatedly, also at regular intervals. All such cases should be watched, debility and vulnerability of the pulmonary structures being at times either concomitant or resulting conditions under such circumstances. Periodical hæmoptysis is occasionally observed after removal of the ovaries.

Naso-pharyngeal Disorders.—These are frequently attended by slight hæmorrhage; as a rule, the blood is brownish and the symptoms of chronic naso-pharyngitis or other local disorders may be present. Tumors, especially fibroma and sarcoma of the nose and naso-pharynx,

may give rise to copious hæmoptysis; but recurrent epistaxis often attracts attention to the seat of the disease. In a case of my own, copious recurrent hæmorrhage was traced to an ulcer in the pharyngeal vault, which proved to be tuberculous. Varices of the pharynx and lingual tonsil occasionally rupture, and may give rise to a copious flow of blood.

Laryngeal Disorders.—In cancer and sarcoma of the larynx, angular foreign bodies in the laryngeal cavity, rupture of a superficial vessel, especially after straining or vomiting and laryngitis sicca, hæmoptysis is of occasional occurrence. Here, also, the blood usually comes up as would ordinary mucus, but it is often unmixed and distinctly arterial. When due to the presence of tumors, shreds of *detritus* are often coughed up simultaneously.

Aneurism.—This is not an uncommon cause of hæmoptysis, through the pressure exerted by the aneurismal mass upon the pulmonary structures and erosions of their tissues. The trachea is frequently pressed upon in this manner by aortic and innominate aneurisms, and the bleeding spot may occasionally be located with the aid of the laryngoscope. Aneurisms of the pulmonary artery, when they rupture, suddenly fill the lung with blood, causing death. Aortic aneurisms may also rupture into the bronchial tract. The blood is ejected in mouthfuls and the secondary manifestations—pallor, unconsciousness, etc.—rapidly follow.

Vascular Fibrosis.—In atheromatous degeneration, especially in elderly persons, the pulmonary capillaries and small vessels of the bronchi sometimes yield, giving rise to a more or less copious flow. This form of hæmoptysis has been called by Sir Andrew Clark “arthritic hæmop-

tysis," since it is usually met with in arthritic subjects. It has occasionally proved fatal; but, as a rule, it constitutes a benign form of hæmoptysis.

Emphysema.—This affection is sometimes attended by hæmorrhage. The blood, unless the quantity be great, is not brought up as it leaves the ruptured capillaries; it usually sojourns some time in dilated alveoli, and is coughed up in thick masses, which sometimes assume the shape of the smaller tubes and are voided as casts.

Thoracic Injuries.—Blows upon the chest, besides penetrating and crushing wounds, often cause hæmoptysis, which may continue several days. (See THORAX, INJURIES OF.)

Unassignable Causes.—Finally, recurrent hæmoptysis sometimes occurs without apparent cause, notwithstanding careful search, and the subject, after a period of great anxiety, does not find his health to have become impaired, and lives many years—sometimes as a standing negation of an injudicious and hasty diagnosis. Now that microscopical examination of the sputum alone forms the basis of the decision when tuberculosis is suspected, such errors are not as frequent. Cases of this kind, however, should be watched, and, if the patient be weakly and anæmic, measures tending to improve the general tone should be instituted and continued long enough to restore the patient to perfect health.

PULMONARY APOPLEXY.—This consists in extravasation of blood into the air-cells and interstitial pulmonary tissue, as a result of aneurismal rupture, penetrating wounds, ulceration involving a large vessel, septico-pyæmia, cerebral disease, and other conditions in which the pulmonary parenchyma is torn.

As here understood, pulmonary apoplexy only applies to rarely-observed

cases in which the organ is overwhelmed with blood, which gushes out of the mouth in great volume. Intense dyspnoea, collapse, and death follow in quick succession. In some cases the hæmorrhage is, so to say, localized, and the hæmoptysis is not severe. Soon, however, an abscess and at times gangrene appear, and the patient succumbs from septico-pyæmia.

Treatment of Pulmonary Hæmorrhage.—The treatment of pulmonary hæmorrhage not only varies with the cause, but therapeutic measures addressed to the cardio-vascular system at large are also necessary. Examination of the upper respiratory tract, the nasopharynx, the pharynx, the larynx, the trachea, the base of the tongue, etc., may reveal a bleeding spot and call for the local application of styptics; besides this, however, measures tending to reduce the vigor of cardiac action—rest, etc.—must be resorted to. A third class of therapeutic indications are those calculated to prevent the recurrence of the hæmorrhages.

If the hæmorrhage is a copious one, the patient should at once be placed in a reclining position, his head being turned to one side to enable him to clear his mouth as fast as it is filled. Whatever be the cause of the bleeding, it cannot be clearly established while it lasts; general measures are therefore alone indicated for the time being. Several remedies at present commonly employed are more pernicious than helpful, particularly ergot, digitalis, and the ice-poultice. Ergot increases vascular tension; digitalis produces the same effect, particularly upon the pulmonary artery; the ice-poultice contracts the peripheral vessels and causes engorgement of the deeper vessels.

Probably the most effective agents are

morphine and atropine, $\frac{1}{4}$ grain of the former and $\frac{1}{100}$ grain of the latter, given together hypodermically. At the same time, a large handkerchief, napkin, towel, or bandage should be *tightly* wound around each extremity, as near the trunk as possible, to momentarily arrest the return of the venous blood to the thoracic organs. This procedure, if properly carried out, at once reduces the pulmonary engorgement and usually arrests the flow unless it is overwhelming. Nitrite of amyl is another remedy which acts promptly. When these agents cannot be obtained, a tablespoonful of salt dissolved in a tumblerful of water generally arrests the flow when the bandages are also applied as stated.

After the hæmorrhage has ceased, the patient should remain where he is an hour or so, then be carried on a litter to a cool room. He should not be allowed to speak. Fainting tends to assist the formation of a clot, and the patient, as a rule, recovers his senses within a short time. The bandages should be removed gradually, fifteen minutes being allowed to elapse between each operation, so as to avoid a sudden tension of the pulmonary arteries. Aconite or veratrum viride may then be used with advantage.

The diet should be light, and easily digested food should be selected. Alcoholic and other stimulants should be strictly forbidden. Large quantities of liquid of any kind and hot beverages tend to bring on a recurrence of the flow. To assist in preventing this, the formation of a clot should be encouraged; this is best accomplished by chloride of calcium: 10 to 15 grains every two hours, in glycerin. Saline purgatives are valuable to reduce vascular tension, but they should not be utilized when the patient has been greatly weakened by the hæmorrhages if other measures are effective.

The hæmoptysis observed in elderly persons, and due to vascular disorders, is, according to Sir Andrew Clark, aggravated or maintained by the frequent administration of large doses of strong astringents, by the application of ice-bags to the chest, and by indulgence in liquids to allay the thirst created by the astringent. The treatment found most successful by him in these cases is diet, quiet, restricted use of liquids, stilling of the cough, calomel, salines, alkalies with iodide of potassium, and frequently renewed counter-irritation. (See also TUBERCULOSIS, volume vi.)

Pulmonary Embolism.

This consists of a mechanical obstruction of one or more pulmonary arteries by an embolus or thrombus.

Symptoms.—While a diminutive infarction may pass unnoticed, complete occlusion of a large pulmonary artery may occasion instant death. Symptoms arise when the embolus does not completely fill the lumen of the artery involved, or when the latter is not of sufficient size to completely disturb the pulmonary circulation, even though the vessel be completely occluded. Under these circumstances, dyspnœa is experienced. It gradually increases in severity, and may be preceded by unconsciousness and convulsions. The patient gasps for breath and indicates, by his frantic efforts to inhale, the intensity of his suffering. The pulse becomes weak and thready; the skin is cold and clammy and is covered with sweat. Severe localized pleuritic pain and a hard and harassing cough are usually present, and the patient expectorates masses of bloody gelatinous mucus. This reveals, upon microscopical examination, peculiar large lymph-cells resembling alveolar cells and embodying blood-corpuscles. These

giant cells are thought to transform the blood-corpuscles into pigment-matter. They are seen especially in cases of heart disease, and are known as the "cells of heart-failure" (Whittaker). As the case progresses, local suppuration with metastatic abscesses occur, and all the evidences of pyæmia may appear. Dissolution of the thrombus may take place and the abscesses may undergo resolution; but, as a rule, the prognosis is serious.

Diagnosis.—When associated with the symptoms enumerated,—dyspnœa, syncope, bloody expectoration, etc.,—the physical signs assist in establishing the diagnosis. But they are only clearly obtained when the lesion is not too deeply seated. A localized consolidation giving rise to dullness under percussion, bronchial respiration, increased resonance, and a friction-sound, when the tension is near the pleura, represent the only signs which may be attributed to the embolus, all others being due to conditions developed secondarily.

Literature of '96-'97-'98.

Four typical cases of pulmonary embolism in childbed with severe symptoms noted, three ending fatally. The fourth occurred in a woman who had passed through a normal labor and got up on the tenth day; one main branch seems to have been plugged, but the patient recovered. Vogt (*Norsk Mag. for Lægevid.*, p. 1, 130, '97).

Etiology and Pathology.—Pulmonary embolism is due to stasis, in the majority of cases, the primary factor being a pulmonary or cardiac affection. The infarct generally consists of a mass of leucocytes and red corpuscles. It is usually firm and brownish and varies in size from that of a cherry to that of an entire lobe, since in some cases the entire vascular supply of a lobe is involved. Its envelope is formed of a thin film of fibrin.

Hæmorrhagic infarctions often develop near the pleura and at the back of the lower lobe.

Treatment.—This can only be symptomatic, the patient's strength being sustained and the patient's position so adjusted as to facilitate respiration; this is usually best accomplished by elevating the upper part of the body. Gessner (*Centralb. f. Gynäk.*, No. 6, '97) recommends hypodermic injections of ether or morphine.

Pulmonary Œdema.

Definition.—Œdema of the lungs is due to the escape of serum through the vascular walls into the alveolar wall and interstitial tissue.

Symptoms.—Œdema appears and progresses more or less insidiously, the dyspnœa resulting from reduced respiration being marked in proportion. The respiration at first becomes hurried; a feeling of suffocation is experienced, accompanied by considerable anxiety and great muscular effort to facilitate the respiratory act. Cyanosis soon appears if the effusion involves much interstitial tissue, and intense suffering is sometimes witnessed. The infiltration is usually bilateral and ascends from the lower lobes.

The sputum may not be increased at first, but, as soon as the quantity of serum in the alveoli becomes great, it becomes very abundant and frothy. In some cases it is thin and watery; in others it is sufficiently viscid to markedly increase the dyspnœa through laryngeal obstruction. A peculiarity of the sputum at this stage is that it is more or less tinged with red, due to the presence of red blood-corpuscles. It may also contain urea.

The pulse is generally rapid and feeble, the weakness increasing as the infiltration progresses. No fever is present unless due to an intercurrent or underlying affection. The extremities become cold

and the patient in extreme cases dies from heart-failure and carbonic-acid poisoning.

Examination at once reveals the reduced respiratory area, through inspection, the motions of the chest being restricted; percussion shows dullness over the infiltrated regions and resonance—at times tympanitic—above; auscultation, eliciting moist mucous and submucous râles, with gurgling, increasing as the involved tissues are approached. With Bianchi's phonendoscope the gradual progress of the œdema can generally be traced with accuracy.

Diagnosis.—The diagnosis is not difficult, owing to the comparative suddenness of the onset, the demarkation between the free and the infiltrated area, and the absence of fever.

BRONCHO-PNEUMONIA.—This affection presents some points of resemblance; but the fever is marked and the physical signs are different, no clear distinction being traceable between the affected and non-affected areas. The mucous râles occur late in the course of the disease; in the œdema they are present almost from the start.

HYDROTHORAX.—This affection also presents considerable resemblance to œdema, but change of position does not alter the area of dullness in œdema, whereas the flow of liquid to another part of the chest causes a corresponding change in the seat of the dullness in hydrothorax. Moist râles are not present in the latter unless due to a concomitant disorder.

Etiology and Pathology.—Œdema of the lungs usually occurs as a final complication of other affections, but it may appear idiopathically after a too-hot bath, the copious ingestion of ice water, etc. It is thought to be due to one of three general causes: paresis of the vascular walls,

impediment to the free circulation in a diseased organ, or disease of the vessels through increased permeability. Vascular paresis appears to be the source of the infiltration in cases occurring suddenly in healthy persons. Impediment to the circulation is found in connection with Bright's disease, of which it is a very frequent complication as a terminal manifestation of dropsy, septicæmia, pneumonia, and other infectious diseases. In the latter case the sputum is usually more deeply blood-tinged than in the form due to renal trouble. It is also met with in grave anæmia, cerebral injuries, and valvular heart affections. Welch showed that œdema of the lungs could be produced by weakening the left ventricle. It may also occur as a result of hypostatic congestion; it is then termed "hypostatic œdema."

Acute œdema of the lungs is due to disturbances of the cardio-pulmonary innervation, to excessive pulmonary tension, and to sudden failure of the right ventricle. Huchard (*Med. Press and Circ.*, Dec. 11, '95).

The transudation of serum may either be local (*i.e.*, limited to an area involved in an inflammatory process through which the vascular walls are weakened, and osmosis of the serum rendered possible) or general. In the latter type the transudation, serous or sero-sanguinolent, invades the tissues and alveoli, and the lung at autopsy is much heavier than the normal organ, and sinks in water.

Prognosis.—The prognosis of pulmonary œdema is grave in all cases in which it occurs as a complication, its gravity depending on that of the causative affection. In the so-called "idiopathic" cases, those occurring independently of any primary disease, the chances of recovery are much greater. The œdema following Bright's disease and pneumonia present a particularly unfavorable prognosis.

Treatment.—Œdema of the lungs being due in practically all cases to another disease, the treatment of the latter is the foundation of the measures to be adopted plus one very important indication: to sustain the heart by every means possible, heart-failure being the main cause of death. Caffeine, digitalis, and strychnine are the mainstays as far as remedies are concerned.

Literature of '96-'97-'98.

There are three elements in the production of acute œdema which have to be combated: First, the enormous pulmonary hypertension and the sudden or rapid enfeeblement of the right ventricle overcome by this hypertension; second, the troubles of innervation, cardio-pulmonary; and, third, the very frequent renal impermeability.

To counteract the first, a large general bleeding to the amount of 10 or 12 ounces and injections of caffeine may be ordered. Against the second preparations of strychnine may be employed. On account of the third, a milk diet may be given, and theobromine ordered in doses of 20 to 40 grains a day. Huchard (Gaz. des Hôp., Apr. 29, '97).

Derivatives are of value to relieve as much as possible the vascular engorgement. In the early stages a hot mustard foot-bath affords considerable relief, especially if coupled with the copious use of dry cups over the infiltrated area.

Literature of '96-'97-'98.

A large, thick jacket poultice, either made in one piece or in sections, large enough to envelop the whole chest and thick enough to retain its heat for a considerable time, will often in a few moments bring the patient relief in œdema of the lungs. The mode of procedure is to apply a mustard poultice, 1 to 10, to the whole chest until the surface is reddened; then to remove this and apply the above-described poultice, and renew it, not after the lapse of a particular number of hours, but when

it is becoming cool. Pilocarpine should be used and the heart should be stimulated. Phlebotomy is useful in œdema in a strong person suffering from an acute disease. L. F. Bishop (Amer. Medico-Surg. Bull., Feb. 22, '96).

When the œdema shows signs of increase or when the case from the start assumes severe symptoms, venesection should at once be resorted to.

The best treatment in acute œdema of the lungs is venesection from the arm, wet-cupping over the chest and liver, and subcutaneous exhibition of caffeine, but, above all, camphorated oil (1 to 5); 3 or 4 Pravaz syringefuls a day must be injected. Strychnine may be useful, but morphine is dangerous. Huchard (Med. Press and Circ. Dec. 11, '95).

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PULMONARY EMPHYSEMA.

Definition.—Pulmonary emphysema is characterized by the presence of an excess of air in the alveoli and infundibular passages, with atrophy of the alveolar walls, or by the adventitious presence of air in the interstitial alveolar tissue.

Varieties.—Emphysema is divided into two general varieties: the *vesicular*, in which the infundibular passages and alveoli are dilated, and the *interlobular*, in which the air has penetrated the interstitial alveolar tissue. The vesicular form is, in turn, subdivided into three varieties: the *substantive*, or *hypertrophic*, in which there is distension of the alveoli with atrophy of their walls, which gives rise to general enlargement of the lung; the *senile*, in which there is atrophy and shrinkage of the lung; and the *compensatory*, in which the air-cells of a part or the whole of one lung become enlarged so as to assume the functions and compensate for diseased portions of the opposite lung.

Vesicular Emphysema (Substantive, or Hypertrophic, Form).

Symptoms.—The onset and progress of emphysema are so insidious that the disease may be present a long time before it is recognized. Slight dyspnœa upon exertion is the first symptom usually noticed. This gradually increases in intensity until the feeling of suffocation is only absent when the patient is lying or sitting quietly; as soon, however, as he moves about, ascends stairs, etc., the dyspnœa appears. Under violent exertion and in advanced cases the dyspnœa may become exceedingly severe and be attended by cyanosis. The latter, however, may not only attend a severe attack of dyspnœa, it is sometimes present while the patient is not in active motion. As the disease progresses, both the cyanosis and the dyspnœa become more marked. The patient, as a rule, experiences discomfort, not while inhaling, but while exhaling, wheezing and prolongation of the expiratory act suggesting asthma. The wheezing is not apt to be marked, however, unless catarrhal inflammation of the bronchial mucous membrane be also present. The labored breathing interferes with speech, and is a source of fatigue. The inspiration is sudden and jerky, while the expiration is prolonged and noisy. As the disease progresses, the dyspnœa becomes more distressing, and is aggravated by indiscretions in diet. Congestive disorders of the internal viscera, the liver, the intestine, the kidneys, and sometimes ascites may appear, followed, in turn, by emaciation and loss of strength.

Most important of all these associated disorders is bronchitis, which complicates the majority of cases. The attack may be mild and last but a short time and be attended by harassing cough, mucoid expectoration sometimes streaked

with blood; or it may assume a more violent and continuous form, in which the cough and the dyspnœa, combined, so closely simulate an access of typical asthma as to mislead the medical attendant. The sputa are apt to be muco-purulent in such cases, and hæmoptyses suggesting the early signs of pulmonary tuberculosis are frequently observed. The slow progress of the major disease and the recurrence of the acute symptoms of bronchitis every winter, serve, however, to establish the diagnosis. During the summer emphysematous patients are sometimes sufficiently comfortable to lead to the belief that a complete cure has been effected. This form is frequently observed in young adults, whereas continuation of the emphysematous symptoms throughout the year, though characterized by exacerbations during the winter, is usually met with among old subjects. Cardiac symptoms often prevail, the result of hypertrophy followed by dilatation. These, in turn, are brought on by pulmonary congestion induced by the interference with circulation in the diseased areas.

Diagnosis.—Physical examination of advanced cases of emphysema renders a diagnosis comparatively easy in the majority of cases. The "barrel-chest," having all its diameters, especially the antero-posterior, markedly increased; the prominent scapulæ and increased spinal curve and rounded back; the limited motion of the ribs, with unusually wide areas between them; and the prominent costal cartilages and sternum, below which the deep sternal fossa appears in striking contrast, are typical signs. The muscles of the thorax may be enlarged, and the thorax appear raised. The clavicles may stand out horizontally to an unusual degree, causing the head to sink deeper between the shoulders. In

less advanced cases, however, the thoracic changes are, of course, less marked and the disease may have lasted a considerable time without giving rise to deformation of the chest. In all, however, and varying in degree with the progress of the disease, there is reduction of the relative expansion; the chest increasingly refuses to expand, notwithstanding the manifest muscular efforts which seem only to raise the entire chest upward. In truth, it is to inability to liberate imprisoned air that the reduced chest-expansion is due, the residual air being greatly in excess, and so filling the emphysematous cavities as to prevent contraction of their walls. The resiliency of the latter is further impeded by the diseased condition of the alveolar structures. Mensuration shows that, while normal expansion reaches three to four inches, an emphysematous chest sometimes does not expand an inch; in rare cases no expansion can be noted. The impact of the heart is often lost, the organ being depressed or concealed by overlapping lung.

On auscultation, a marked feature of the disease is the difference between inspiration and expiration. While the former is feeble, sufficiently so sometimes as to be hardly audible, and shortened, the expiration is greatly prolonged, low in pitch, wheezy, and comparatively coarse, while, if bronchitis be a feature of the case, there are moist râles and other symptoms peculiar to this complication.

Perussion yields a peculiar drum-like note, the "band-box" tone of Biermer, especially marked over the emphysematous area. This sometimes so overlaps the cardiac area as to cause disappearance of the cardiac dullness, and sufficiently extend downward on the right side as to bring the upper margin of the hepatic

dullness to a much lower level. Occasionally the splenic dullness is influenced in the same manner. Occasionally a net-work of dilated veins outlines the junction of the diaphragm to the anterior wall. Palpation enables the examiner to realize the diminished chest-expansion and the almost complete disappearance of the respiratory fremitus.

Prognosis.—The prognosis of emphysema is, as a rule, unfavorable when the disease is at all advanced. The local lesions progress steadily, though very slowly, and the patient is often carried to his grave by intercurrent disorders, especially pneumonia. A heart disorder is almost always present as a direct result of the interference with the circulation, and dropsy and death may ensue from cardiac hypertrophy and distension. The disease is one of long duration; its progress may be stayed to a great extent by removal to a warm and equable climate, by proper hygienic surroundings, and general comfort.

Etiology.—Bronchitis, asthma, and, more rarely, pertussis are the main causes of pulmonary emphysema: to these factors may be added excessive and prolonged manual labor, playing on wind-instruments, glass-blowing, and other conditions inducing undue air-pressure within the pulmonary lobules. All these etiological factors bring on emphysema, however, only when the lung-tissue is congenitally weak. The nutritive changes in the air-cells play an important rôle in the production of the affection: a fact strongly sustained by "the markedly hereditary character of the disease and the frequency with which it starts early in life." Osler lays special stress upon these two points, and refers to the observations of James Jackson, who, out of twenty-eight cases, studied

under Louis's direction, found that in eighteen one or both parents were affected. It is also observed in several members of one family. Asthma brings on emphysema by interfering with the exit of air. It may also be brought on by mitral disease as a result of the pulmonary congestion induced.

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Two essential factors contributing to the enlargement of the chest in hypertrophic emphysema are defective pulmonary elasticity and dyspnoea. Mere loss of pulmonary elasticity, by inducing thoracic expansion, is sufficient to bring about emphysema. Diminution of the expiratory range is one of the worst aspects of emphysema, and is brought about by fixation of the chest. The treatment should aim at preservation of the elasticity of the lungs, prevention of the overaction of the costal elevators, so as to check thoracic expansion, and maintenance of the normal mobility of the thorax. H. Campbell (*West London Med. Jour.*, p. 177, July, '97).

Pathology.—When the lungs are examined post-mortem, they are found to be greatly enlarged and devoid of elasticity. When cut, they are pale and occasionally show an absence of pigmentation: Virchow's "albinian condition."

Specimens of emphysematous lungs exhibited to the Berlin Medical Society, showing absence of pigmentation, termed by the author an albinian condition of the lung, sometimes found in post-mortems. Tubercles never found in a lung which was the seat of emphysema, and in only one instance pneumothorax found. Virchow (*Berl. klin. Woch.*, Jan. 2, '88).

Emphysema and tuberculosis are sometimes co-existent. The former may succeed the latter or have preceded it. In the first case it is limited: in the latter it is often accompanied by chronic pneumonia. Potain (*La Sem. Méd.*, July 9, '90).

The lung-tissue pits readily on pressure,—one of the most marked features, according to Osler; and to the touch it conveys what he terms a "downy, feathery feel." The same author describes the morbid changes in the air-vesicles and bronchi as follows: "Beneath the pleura greatly-enlarged air-vesicles may be readily seen. They vary in size from $\frac{1}{2}$ to 3 millimetres; and irregular bullæ, the size of a walnut or larger, may project from the free margins. The best idea of the extreme rarefaction of the tissue is obtained from sections of a lung distended and dried. At the anterior margins the structure may form an irregular series of air-chambers, resembling the frog's lung. On careful inspection with the hand-lens, remnants of the interlobular septa or even of the alveoli may be seen on these large emphysematous vesicles. Though general throughout the organs, the distension is more marked, as a rule, at the anterior margins, and is often specially developed at the inner surface of the lobe near the root, where in extreme cases air-spaces as large as an egg may sometimes be found. Microscopically there is seen atrophy of the alveolar walls, by which is produced the coalescence of neighboring air-cells. In this process the capillary net-work disappears before the walls are completely atrophied. The loss of the elastic tissue is a special feature. It is stated, indeed, that in certain cases there is a congenital defect in the development of this tissue. The epithelium of the air-cells undergoes a fatty change, but the large distended air-spaces retain a pavement-layer.

"The bronchi show important changes. In the larger tubes the mucous membrane may be rough and thickened from chronic bronchitis; often the longitudi-

nal lines of submucous elastic tissue stand out prominently. In the advanced cases many of the smaller tubes are dilated, particularly when, in addition to emphysema, there are peribronchial fibroid changes. Bronchiectasis is not, however, an invariable accompaniment of emphysema, but, as Laennec remarks, it is difficult to understand why it is not more common. Of associated morbid changes, the most important are found in the heart. The right chambers are dilated and hypertrophied, the tricuspid orifice is large, and the valve-segments are often thickened at the edges. In advanced cases the cardiac hypertrophy is general. The pulmonary artery and its branches may be wide and show marked atheromatous changes."

Treatment.—As already stated, change of residence to an equable and warm climate is of great value, especially in cases characterized by bronchitis and asthma. Any stenotic disorder of the naso-pharynx should be corrected and the patient should give careful attention to the bowels and receive nutritious, though easily digested, food. While no remedy is known to greatly influence the disease, much may be done to relieve the patient's discomfort. Pressure upon the abdomen by means of an abdominal belt is sometimes helpful (Berdez). Oxygen inhalations are also of great value, 2 or 3 gallons being administered three times a day (Reid, Skeritt). As an internal remedy, none is better than strychnine, the dose being gradually increased. Urgent dyspnoea and lividity occurring in young and vigorous subjects are bled by Osler, who states that he has saved lives in so doing. Aspiration of the air in large cavities has been used with success by Wigmore.

When the heart begins to fail, rest in bed is required, and, if this does not

overcome the œdema, digitalis should be given. Three to 4 $\frac{1}{2}$ grains of the powder, preferably in the infusion, are given the first day, and continued until two quarts of urine are passed in twenty-four hours, or until the action of the drug is indicated in the pulse (Liebermeister).

Senile, or Atrophic, Emphysema.—In this form of vesicular emphysema, carefully studied by Jenner, the alveolar septa become atrophied and large air-spaces are formed; the atrophy being general, though irregularly progressive, the organ becomes reduced in size, thus constituting "small-lunged emphysema" of Jenner; and contraction of the chest-wall—which is not always perceptible—constitute about all the symptoms, and even these are usually hidden by those of catarrhal tracheo-bronchitis, from which these patients almost always suffer. As implied by its name, the disease is one of old age.

TREATMENT.—The treatment of this condition is symptomatic, though measures indicated in chronic bronchitis are often beneficial. Strychnine is a valuable tonic, especially when the hygienic indications recommended in the treatment of the hypertrophic form can also be carried out.

Compensatory Emphysema.—As its name indicates, this form of emphysema is compensative; it affords an increase in the respiratory capacity in various parts of the lung to make up for that lost in other parts through local disease, especially tuberculosis, lobular pneumonia, pleurisy, and extensive pleural adhesions. Tuberculous areas and cavities or cicatricial masses occupying formerly diseased spots, especially when situated near the peripheral parts of the organ, are almost always surrounded by areas of distended air-vesicles. The opposite lung may also and often does as-

sume vicarious distension to compensate for the loss of respiratory area in an extensively-diseased lung. This occurs especially in cases of pulmonary fibrosis and tuberculosis.

Case of compensatory emphysema which occurred in tuberculosis in which one lung was doing the work of two. Vansant (Times and Register, May 17, '90).

Case observed in which the entire left lung was reduced to the condition of one single air-sac. Guttman (Deut. med. Woch., Apr. 23, '91).

Whether the compensation is truly such—*i.e.*, a provision of Nature to prolong life through vicarious continuation of a physiological process—or whether the vesicular dilatation merely occurs as the result of the increased pressure resulting from restriction of air-space elsewhere cannot be determined. Both features of the process seem, however, to be involved concurrently. At first the dilated alveolar walls remain histologically normal, but, when the case is advanced, atrophy becomes manifest and the lesions of true emphysema are to be found.

Interlobular Emphysema.—This form of emphysema is due to the escape of air into the interlobular connective tissue, and thence in a large proportion of cases to adjoining structures. It is usually brought on by injuries of the lung-tissue, during which the latter is punctured or torn. It may also be caused by excessive effort, in which the diaphragm exerts pressure upon the lungs, as during the act of "bearing down" in parturition, defecation, violent coughing, etc. In all such cases there is also, doubtless, a congenital weakness of the pulmonary tissues.

The air-cavities thus formed vary in size from that of a pea to that of an egg. At times, rupture occurs at the junction

between the lung and the trachea, the air penetrating the subcutaneous areolar tissue of the neck and sometimes far beyond this region.

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Three cases of subcutaneous emphysema complicating measles observed in one family. There was probably a congenital weakness of the pulmonary vesicles, and also a predisposition produced by whooping-cough. Galliard (Jour. des Prat., Nov 25, '97).

Half an hour after being run over by a wagon, a robust, 8-year-old boy was found to be suffering from emphysema, extending over the whole body except the palms and soles. Penis and scrotum were so puffed up as to resemble oblong rubber balls, and an attempt to hold the eyelids open with adhesive straps proved unavailing because of the tense state of the skin. The tissues under the scalp were also involved, crackling being distinctly perceived. The skin of the whole body was tense and pale. There were slight contusions on the elbow and chest. Respiration was labored. Palpation disclosed fractures of the sternum and second right rib. Three hours later the emphysema had so increased as materially to interfere with respiration; skin stretched almost to the limit of its elasticity; increasing cyanosis. On incising the chest the effect was instantaneous, as if a tense rubber ball had been pricked, and breathing immediately became deeper and slower. Two rubber drainage-tubes were inserted and left in for five days. Next day a pneumonia jacket was applied, after which the treatment was expectant and symptomatic, the only complication being a mild localized pleurisy and hæmoptysis. The pneumothorax had practically disappeared on the sixth day, by expulsion rather than by absorption. The air in the tissues was absorbed so slowly that it could still be detected therein eighteen days afterward. C. G. Molin (Brooklyn Med. Jour., Oct., '97).

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PURPURA. See VASCULAR SYSTEM.

PYÆMIA. See SEPTICÆMIA AND PYÆMIA.

PYRIDIN.—Pyridin is a basic substance obtained by dry distillation of organic compounds containing nitrogen (bone-oil, coal-tar, naphtha, etc.). It occurs as a colorless, limpid, hygroscopic liquid, having an empyreumatic odor and a sharp taste, and freely miscible with water, alcohol, ether, chloroform, benzin, and the fatty oils. Pyridin forms salts with the acids. The dose of pyridin for internal administration is 2 to 10 drops in water, several times daily. By inhalation, 45 to 75 minims placed in a saucer may be evaporated spontaneously in a room, or 5 to 20 drops in 2 ounces of water may be inhaled from an atomizer, or 3 to 5 drops directly.

Physiological Action.—According to Blanc, pyridin, if inhaled in small dose, produces slight somnolence, headache (with congestion of the face), and sometimes a little vertigo. The inspiration acquires a remarkable amplitude, the blood-pressure diminishes, and there is a general vasodilatation. The excitomotor power of the medulla and spinal cord is profoundly changed, their excitability being calmed. The bronchial secretion is somewhat increased. Absorption of pyridin by the air-passages is rapid and elimination by the urine almost equally so, being complete within fifteen minutes; it is also eliminated by the lungs and the glandular apparatus of the digestive tract, thus increasing the gastric secretion, exciting the appetite, and favoring digestion. This rapid elimination permits the use of large doses with safety.

Therapeutics.—Pyridin was intro-

duced by Germain Sée as a remedy for the relief of bronchial asthma. One drachm of pyridin is left to evaporate spontaneously from a plate placed in the patient's room. At a temperature of 68°-77° F. this quantity will evaporate in about one hour.

In order to treat affections of the air-passages, especially asthma, 1 drachm of pyridin is placed in an iron spoon and held over a lamp in the patient's room. When the vapors are inhaled an amelioration of the symptoms often follows. Editorial (Satellite of the Annual, Feb., '89).

Pyridin used with brilliant success in several cases in which the symptom of asthma demanded immediate relief. A patient, however, would never inhale it for a second attack because of its disagreeable, penetrating, and lasting odor. R. W. Watson (Amer. Jour. Med. Sci., Mar., '94).

Angina pectoris is said to be relieved by the internal use of 5 to 10 minims daily, increased to 25 minims daily.

De Renzi found pyridin an excellent heart-stimulant in doses of 6 to 10 drops,—in water, per day,—increased to 25 drops. It was as well borne as digitalis, and acted better in asystolic conditions.

PYROGALLOL.—Pyrogallol (U. S. P.), or pyrogallic acid, is a triatomic phenol, obtained chiefly by the dry distillation of gallic acid. It occurs in white, lustrous, odorless, scales or needles, having a bitter taste and soluble in 2 1/2 parts of water, in alcohol, and in ether. It is a strong reducing agent, to which property it largely owes its therapeutic effects. It darkens on exposure to light. Its watery solutions, or even the moistened crystals, in contact with the air, absorb oxygen and acquire a brown color; the reaction of the fluid also changes from neutral to acid. The color-change takes place more rapidly

if a caustic alkali is present in the solution. It is not administered internally. It is used externally in ointment and in powder (10 to 20 per cent.). The stronger ointments have a caustic effect. Pyrogallol possesses antiseptic properties.

Poisoning by Pyrogallol.—The incautious application of pyrogallol may cause inflammation of the skin up to the point of ulceration and sloughing. Fatal intoxication has followed the inunction of one-half the body with a 10-per-cent. ointment, the surface being afterward covered by gutta-percha tissue and a bandage (Neisser). The symptoms began within two hours, with rigors, diarrhœa, vomiting, and strangury. The next day the urine was very dark colored (hæmoglobinuria); all the symptoms became aggravated, with apathy, dyspnœa, exaggerated reflexes, and collapse, followed by death two days later.

Treatment of Poisoning by Pyrogallol.

—On the first appearance of gastro-intestinal disturbance, strangury, or smoky urine, the remedy should be at once discontinued. Neisser suggests, further, the subcutaneous injections of ether, alcoholics frequently repeated, energetic stimulation of the surfaces, and the inhalation of oxygen. The mineral acids act as antidotes.

Therapeutics.—Pyrogallol was introduced in 1878 by Jarisch as a remedy in psoriasis and lupus. It has since been shown to be of value in parasitic diseases, as eczema marginatum, in epithelioma, in simple chancre, and in phagedæna. Unfortunately, it stains the skin, hair, and nails, as well as linen apparel with which it comes in contact.

In psoriasis a 10- to 15-per-cent. ointment is thoroughly rubbed into the affected areas. In lupus pyrogallol acts upon the diseased tissues as a mild escharotic. The rapidity of its action is

increased when the epidermis is intact by first applying a moderately-strong solution of caustic potash. A 10- to 20-per-cent. ointment is applied on lint, and covered with a piece of gutta-percha tissue, which may be made to adhere to the skin by moistening its edges with chloroform. The applications are renewed daily, for two to seven days, until the lupus patch has been converted into a gray, pultaceous mass. Iodoform ointment or a mercurial plaster is then applied. This treatment is applied at intervals so long as any lupus tubercles are visible.

In lupus Besnier has used a saturated solution of pyrogallol in ether, which he brushes over the lupus patch and covers with traumaticin. Brocq prefers a solution of pyrogallol with salicylic acid (10 per cent. of each) in collodion.

Literature of '96-'97-'98.

In tuberculous processes affected tissues destroyed with ointment composed of vaselin containing 10 per cent. of pyrogallol; this is spread on lint and applied to the part for three to five days. Wound so produced is then allowed to heal, being dressed with a vaselin ointment containing from $\frac{1}{2}$ to 2 per cent. of pyrogallol. Cases of tuberculosis of the skin, even when extending deeply, treated in this way; and results have been good. It is necessary to keep a close watch on the urine of the patients, to prevent poisoning by the absorption of the pyrogallol. Veiel (*Archiv f. Derm. u. Syph.*, B. 44, '98).

Epithelioma is treated in the same way as lupus. In simple chancre Vidal used a 25-per-cent. ointment and for phagedæna a powder of pyrogallol and starch (1 to 4).

In epithelioma of the skin one of the best caustics is pyrogallie acid. Its action is slow, it is easy to regulate the amount of destruction, and the drug is

less painful than others of the same class. When a deep action from the drug is desired, the eschar must be re-

moved with poultices from time to time, and the remedy reapplied. Hartzell (Ther. Gaz., Nov. 15, '94).

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QUASSIA.—Quassia (U. S. P.) is the wood of *Picræna excelsa*, Lindley (nat. ord., *Simarubæ*): a large tree indigenous to Jamaica and other parts of the West Indies. It occurs usually in the form of small chips or raspings, nearly white in color, odorless, but very bitter. The wood is sometimes turned into cups, which are used by pouring hot water into them, and allowing it to remain for several hours; the water becomes quite bitter, having absorbed the bitter principle from the wooden cup. Quassia contains a bitter, neutral principle, quassin (quassiin), which occurs in white, opaque, intensely-bitter crystals; is soluble in alcohol, hot water, and chloroform and slightly soluble in cold water. It also contains a minute quantity of a volatile oil, but no tannin. The fluid extract is an alcoholic preparation. The tincture of the present pharmacopœia (1890) is 50-per-cent. stronger than of the former one (1880).

Preparations and Doses.—Quassia (U. S. P.).

Extractum quassiæ, U. S. P. (solid aqueous extract), 1 to 3 grains.

Extractum quassiæ fluidum, U. S. P. (fluid extract), 5 to 30 minims.

Tinctura quassiæ (U. S. P.), $\frac{1}{2}$ to 2 drachms.

Infusum quassiæ, B. P. (infusion, 1 drachm to 10 ounces), $\frac{1}{2}$ to 2 ounces.

Quassin (neutral principle, not official), $\frac{1}{32}$ to $\frac{1}{2}$ grain.

Poisoning by Quassia.—Taken in overdose, quassia acts as an irritant of the mucous membrane of the stomach

and as a nauseant. Potter reports serious symptoms of narcotism from quassia in a child of four years. In dose of about $\frac{1}{4}$ grain Campardon found quassin to produce severe headache, severe burning pain in the throat and œsophagus, nausea, vertigo, restlessness, diarrhœa, and frequent passage, but diminished secretion of urine.

F. Venn, of Chicago, reported a fatal case of poisoning from a decoction of 2 ounces of quassia injected into the rectum of a child for the treatment of seat-worms (Univ. Med. Mag., Jan., '95).

Therapeutics.—Quassia is a simple bitter without astringency, and has been found useful in convalescence from acute fevers to increase the appetite and improve the digestion. In atony of the stomach, or simple dyspepsia with eructations after meals, the administration of quassia is followed by good results. It is used in diarrhœa from indigestion and as a stomachic in malarial affections. An infusion of quassia (1 to 2 ounces to the pint of boiling water) as a reliable remedy, given as an enema, to destroy thread-worms (ascarides) in children. Before giving the enema ($\frac{1}{2}$ ounce to 1 pint) the bowel should be well washed out by injections of soap and water. The enema should be retained for some minutes.

QUEBRACHO.—Quebracho, or aspidosperma (U. S. P.), is the bark of the *Aspidosperma quebracho blanco* (nat. ord., *Apocynaceæ*): a large tree indigenous to Brazil and Catamarca (Argentine Re-

public). It contains 5 alkaloids: aspidospermatine, aspidosamine, quebrachine, hypoquebrachine, and quebrachamine. Quebrachine is the most commonly employed. Aspidospermine, an impure mixture of the alkaloids (G. Bardet), may be had as a fluid extract or as a solid extract.

Aspidospermine (Hesse-Merck) occurs as a yellowish-brown amorphous powder, which darkens upon exposure; is soluble in alcohol, ether, chloroform, and benzole; and is given in doses of from 1 to 2 grains.

Aspidospermine (Fraude-Merck) occurs in needle or in pointed prismatic crystals, which are soluble in alcohol, ether, chloroform, and benzole, and is given in doses of from $\frac{1}{3}$ to 1 grain. The citrate, hydrochlorate, and sulphate are soluble in water and alcohol.

Quebrachine occurs in colorless to yellowish crystals, which darken upon exposure, have a bitter taste, are soluble in chloroform, hot alcohol, hot ether, and amyl-alcohol. It is given in doses of from 1 to 2 grains. The hydrochlorate occurs in white crystals soluble in water and in alcohol.

Hypoquebrachine occurs as a yellow, or brown, amorphous, bitter powder; it agglutinates in masses and is soluble in alcohol, ether, and chloroform. The hydrochlorate occurs as a yellow powder, soluble in water and in alcohol.

Quebrachamine occurs in white, bitter crystals or scales, which are slightly soluble in alcohol, ether, and chloroform. The sulphate occurs in white crystals, soluble in water and in alcohol.

Preparations and Doses. — Aspidosperma, U. S. P. (the crude drug), 5 to 30 grains.

Extractum aspidospermatis fluidum, U. S. P. (fluid extract), 5 to 30 minims.

Aspidospermine (amorphous) and salts, 1 to 2 grains.

Aspidospermine (crystalline) and salts, $\frac{1}{2}$ to 1 grain.

Quebrachine and salts, $\frac{1}{2}$ to 2 grains.

Tinctura aspidospermatis (40 to 50 per cent.), 5 to 10 minims.

Vinum aspidospermatis (6 per cent.), $\frac{1}{2}$ to 1 drachm.

Poisoning by Quebracho and Physiological Action. — In toxic doses quebracho causes salivation, paralysis of respiration, and diminished action of the heart and convulsions; death is caused by paralysis of the respiratory centre. After prolonged medicinal use quebracho appears to cause a disturbance of the sympathetic nervous system. The blood of animals poisoned by quebracho becomes red. Bardet found that it distinctly increases the depth of the respiratory movements, retards the pulse (contrary to Penzoldt's view), and causes a fall in the temperature.

Therapeutics. — **FEVERS.** — Huchard has pointed out the antithermic properties of quebracho. He believes that the antithermic properties reside principally in quebrachine, which may be given in doses of from $\frac{1}{2}$ to 2 grains.

In acute rheumatism and in inflammation of the serous membranes quebracho very sensibly diminishes the pulse-rate and the temperature.

The alkaloid aspidospermine has been employed as a febrifuge in malarial and other fevers, and, according to Guttman, its dose as an antiperiodic is 18 grains (?), the ordinary dose being 1 or 2 grains.

DYSPNŒA. — Quebracho has been recommended as a remedy for the relief of dyspnœa of all kinds, whether bronchial, cardiac, or nervous.

In asthma accompanied by emphysema, even in the presence of pleurisy or bron-

chitis, Penzoldt finds that the dyspnœa is relieved by the fluid extract given in doses of 20 to 40 minims several times daily. He also advises its use in bronchial asthma and cardiac asthma (where compensation is well established, but not when due to a weak, diseased heart).

Flint recommends this drug in dyspnœa from mitral insufficiency, and in all kinds of dyspnœa in the absence of other organic disease.

In a case of double pneumonia in a child Lawrence witnessed decided improvement of the respiration and circulation following the use of this remedy.

E. M. Hale calls quebracho and its alkaloid aspidospermine "the digitalis of the lungs." He has used it successfully in most cases in which dyspnœa was a marked symptom. As small a dose as $\frac{1}{500}$ to $\frac{1}{100}$ grain of aspidospermine acts well in asthma and in spasmodic croup.

Huchard claims that dyspnœa is relieved only by the pure aspidospermine, which is the least toxic of all the active principles of quebracho. Bouchard has found aspidospermine valuable in the treatment of all varieties of functional dyspnœa, in doses of from $\frac{1}{4}$ to 1 grain. The alkaloid or its salts may be given hypodermically; the citrate, hydrochlorate, and sulphate are soluble in water. He advises a solution (1 to 60) of the alkaloid, and gives 15 minims ($\frac{1}{4}$ grain).

DYSENTERY.—Bourdeaux has used the fluid extract, in doses of from 20 to 30 drops, in cases of dysentery, with great relief. Enemata of the fluid extract (1 or 2 drachms to the pint of water) may be used for its topical effect, as it is both astringent and antiseptic.

TOPICAL USES.—Bourdeaux has found the topical application of the fluid extract (alcoholic) of quebracho, diluted with water, an energetic astringent and an aid to cicatrization. On fresh wounds

with smooth edges it causes slight pain and stimulation, and induces healing by first intention. Its action is just as favorable in burns and frost-bites, if the ulcers present a rosy aspect. In crushed and lacerated wounds healing takes place, without the formation of pus, after a few applications. It is also a useful injection in endometritis and ulceration of the cervix uteri, a teaspoonful of the extract being added to a cup of water for this purpose.

QUININE (see also CINCHONA).—Quinine, or quinina (U. S. P.), is an alkaloid obtained from the bark of various species of cinchona. It occurs as a bulky, white, amorphous, or crystalline powder, having a very bitter taste. It is soluble in ether, chloroform, benzene (benzole), carbon disulphide, benzin, oils, in 6 parts of alcohol, in 200 parts of glycerin, and in 1960 parts of water. It forms salts with the acids, of which the bisulphate, hydrobromate, hydrochlorate, sulphate, and valerianate are official. The salts of quinine are usually prescribed. For hypodermic use, the bisulphate, carbamidated bimuriate, ethylsulphate, hydrobromate, or quinate is to be preferred, although the hydrochlorate or sulphate may be used.

Quinine bisulphate, or acid sulphate of quinine, occurs in colorless, lustrous crystals, which effloresce rapidly and become opaque upon exposure to the air. It is soluble in 10 parts of water and in 32 parts of alcohol.

Quinine hydrobromate occurs in silky, white, light needles, which are soluble in 0.6 part of alcohol, 6 parts of ether, 12 parts of chloroform, and 51 parts of water.

Quinine hydrochlorate, or muriate, occurs in white, silky needles, which are

soluble in 3 parts of alcohol, 9 parts of chloroform, and 34 parts of water at 59° F.

Quinine and urea hydrochlorate, or carbamidated bimuriate, occurs in clear, colorless crystals, soluble in water and in alcohol. It is used in 50-per-cent. solution for hypodermic injection. Dose, 1 $\frac{1}{2}$ to 8 grains.

Quinine salicylate occurs in fine, white, bitter crystals, soluble in 20 parts of alcohol, 120 parts of ether, and 225 parts of water. It is used as an intestinal antiseptic and in rheumatic affections. Dose, 2 to 30 grains.

Quinine sulphate occurs in white, lustrous, or shining, easily compressible, fragile needles, which are very bitter, absorb moisture from damp air, and darken in the light. The sulphate is soluble in dilute acids, in 3 parts of boiling alcohol, 50 parts of boiling water, 40 parts of glycerin, 65 parts of alcohol; and in 740 parts of water and 680 parts of chloroform at 59° F.

Quinine ethyl-sulphate, sulphovinate or sulpho-ethylate, occurs in white crystals, containing 71 per cent. of quinine, and soluble in 3 parts of water. Dose, 3 to 8 grains.

Quinine quinate occurs in white crystals of very bitter taste, soluble in water and alcohol. Dose, 1 to 30 grains.

Quinine valerianate occurs in lustrous, white, or almost white, triclinic crystals, which have a bitter taste and a slight odor of valerian. The valerianate is soluble in 5 parts of alcohol, and 100 parts of water at 59° F.

Quinine tannate occurs as a light-brown, tasteless powder, slightly soluble in alcohol. It is less active than the more soluble salts, but is preferred for children, because it is tasteless. Dose, 1 to 10 grains.

Warburg's tincture is a combination of

quinine with aromatics; each ounce contains 10 grains of quinine.

(For the description and uses of quinetum, quinidine and salts, quinoidine and salts, quinoline, quinic or kinic acid, quinolinic, quinopieric, and quinovic acids, see CINCHONA, volume ii.)

Preparations and Doses.—Quinina (U. S. P.), 1 to 30 grains.

Ferri et quininae citras (U. S. P.), 3 to 10 grains.

Ferri et quininae citras solubilis (U. S. P.), 3 to 10 grains.

Vinum ferri amarum (U. S. P.), 1 to 3 drachms.

Quininae bisulphas (U. S. P.), 1 to 30 grains.

Quininae hydrobromas (U. S. P.), 1 to 30 grains.

Quininae hydrochloras (U. S. P.), 1 to 30 grains.

Quininae sulphas (U. S. P.), 1 to 30 grains.

Syrupus ferri, quininae, et strychninae phosphatum (U. S. P.), $\frac{1}{2}$ to 1 drachm.

Quininae valerianas (U. S. P.), 1 to 6 grains.

Administration of Quinine.—*Incompatibles.*—Quinine is incompatible with ammonia, alkalies, lime-water, tannic acid, Donovan's solution, iodine, potassium iodide, etc.

Contra-indications.—Quinine is contra-indicated in acute gastritis, acute cystitis, congestion of the kidneys, meningitis, cerebritis, epilepsy, middle-ear disease, and in infantile eczema, because it congests, irritates, or stimulates those areas which are diseased. It is also contra-indicated in those cases which have an idiosyncrasy to its action, where nervous disturbance, cephalalgia, skin eruption, or purpura is caused by small doses, and where these cannot be overcome by the use of the bromides, ergot, and arsenic.

METHODS.—Quinine is seldom given in solution on account of its disagreeable taste, but generally in capsules, gelatin- or sugar- coated pills, or in cachets; if given in a coated pill, the gelatin coating should be thin and the sugar unhardened by age. Quinine in powder may be taken in a dessertspoonful of syrup of red orange or syrup of wild cherry or in a little whisky and water. Quinine may be taken in cascara cordial or in aromatic syrup of yerba santa. Quinine rubbed up with one-fourth its weight of ammoniated glycyrrhizin is practically tasteless of quinine. Abraham Jacobi suggested that quinine be mixed in a tablespoon with enough strong, black coffee, cold, to almost fill the spoon. In young children or delicate persons with delicate stomachs one of the following mixtures will be found palatable: Sulphate of quinine, 16 grains; fluid extract of licorice, 1 drachm; syrup of orange-peel, 2 ounces; a teaspoonful three times a day, for a child of three years. Quinine sulphate, 24 grains; ammoniated elixir of glycyrrhizin, 3 ounces; 1 to 4 teaspoonfuls as required. Quinine chocolates, each containing 1 grain of the tannate (itself almost tasteless), are an eligible preparation for children. An extemporaneous tannate may be prepared by either of the following formulæ: 1. Quinine (alkaloid), 24 grains; tannic acid, 12 grains; syrup of cinnamon, 3 ounces; 1 teaspoonful contains 1 grain of quinine; if the sulphate of quinine is used, the amount of tannic acid must be doubled. 2. Muriate of quinine, 24 grains; tannic acid and ammoniated glycyrrhizin, of each, 12 grains; divide into 12 powders.

Quinine may be given in suppositories. For children, 2 or 3 grains of the hydrochlorate are combined with 15 grains of cacao-butter; for adults, 10 to 25 grains

may be combined with 60 to 90 grains of cacao-butter. Quinine suppositories are apt to cause irritation of the rectum if their use is prolonged, and are therefore not recommended except in special cases, for temporary use, or in an emergency.

Hypodermic Use.—The hydrochlorate dissolved in 10 parts of water contains more alkaloid than the same solution of the bisulphate. Solutions of the hydrochlorate: 1. Quinine hydrochlorate, 7 grains; glycerin and water, of each, $1\frac{1}{2}$ drachm; warm the solution before using and do not add acid. 2. Quinine hydrochlorate, 15 grains; alcohol, 15 minims; distilled water, $1\frac{1}{2}$ drachms, add a few drops of hydrochloric acid to complete the solution before using.

Most excellent method of giving quinine by the endermic method is by means of the following solution:—

R Quininae muriat., 1 drachm.
Chloroformi, 1 drachm.
Vasellini, 1 ounce.

Of this, an amount containing the dose of quinine desired is to be rubbed into either the inner aspect of the thighs or the sides of the chest posterior to the pectoral muscle, a new place being chosen for each application. F. H. Stuart (Brooklyn Med. Jour., Oct., '91).

For hypodermic use, quinine hydrochlorate is superior to all other soluble salts of quinine, since $15\frac{1}{2}$ minims contain $7\frac{1}{2}$ grains of the salt. It contains the same quantity of quinine as the sulphate, while, being much more dense, the same doses are much smaller in size and can be administered in very small wafers. It possesses, in the highest degree, the physiological and therapeutic properties of the quinine salts. Grimaux and Laborde (Comptes-rendus Heb. des Séances et Mém. de la Soc. de Biol., Oct., '92).

Literature of '96-'97-'98.

Following formula for the hypodermic administration of quinine recommended: Hydrobromate or hydrochlorate of qui-

nine, 15 grains; urethane, $7\frac{1}{2}$ grains; warm water 15 minims. Make a solution by aid of heat if necessary. About 30 minims are obtained of a permanent solution, which does not precipitate on cooling, has only a weak reaction, and is absolutely non-irritating. G. Gaglia (La Sem. Méd., June 1, '98).

For subcutaneous injection of quinine, solution which causes hardly any pain and does not give rise to inflammation is as follows: Thirty grains of quinine hydrochloride are dissolved in $2\frac{1}{2}$ drachms of distilled water in a test-tube with the aid of moderate heat. Reaction must be alkaline. Cooled to below 89.6° F., this solution becomes a rather firm mass, but it readily liquefies on being warmed. Von Stoffella (Wiener klin. Rund., No. 1, '98).

If the bisulphate is used hypodermically, add a little tartaric or sulphuric acid, to prevent precipitation of the drug in the alkaline juices of the connective tissue, before it can be absorbed: 1 grain of tartaric acid to each 5 grains of bisulphate of quinine. Lente's solution of the bisulphate is as follows: Quinine bisulphate, 50 grains; dilute sulphuric acid, 100 minims; water, 1 ounce; dissolve with heat, filter, and add 5 minims of carbolie acid.

If the sulphate is used: Quinine sulphate, 10 grains; water, 1 drachm; sulphuric acid, drop by drop until solution is perfected. Bartholow's formula is: Quinine sulphate, 1 drachm; morphine sulphate, $\frac{1}{2}$ grain; dilute sulphuric acid, 40 minims; distilled water, 1 ounce; mix and filter; 60 minims equal $7\frac{1}{2}$ grains of quinine.

The hydrobromate (soluble 1 in 54), the carbamidated bimuriate (one-half as strong in quinine as the other salts; is used in 50-per-cent. solution), the sulphovinate (ethyl-sulphate; soluble 1 in 3), or the quinate may be used by the hypodermic injection.

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Quinine sulphovinate highly recommended for hypodermic administration, since it possesses marked solubility in water (1 in 3). Its quinine-value is about equal to that of quinine sulphate. Preparation of solution from crystals is easily accomplished, and is rendered possible within a few seconds if gentle heat be employed. Solution will keep for a long time, but preservation is especially secured by addition of a little alcohol. Alexander K. Finlay (Med. and Surg. Jour., vol. xlix, p. 200, '96).

The usual dose by hypodermic injection is from $1\frac{1}{2}$ to 8 grains. The best place to inject quinine solutions is in the buttock, between the trochanter and the tuber ischii. Injections of this drug into the calf of the leg are very painful.

In using quinine for hypodermic injections certain precautions should be taken: the solution should not be too strong, a part of the body should be chosen where the cellular tissue is abundant, the syringe and needle should be made aseptic by boiling in water, and the injection should be made slowly. Kelsch (Arch. de Méd. et de Pharm. Mil., Feb., '95).

Intravenous Injections.—Bacelli has suggested the intravenous injection of quinine solutions in pressing cases of malarial infection. The solution used is as follows: Quinine hydrochlorate, 15 grains; chloride of sodium, 15 grains; distilled water, $2\frac{1}{2}$ drachms. This solution, after adding distilled water, should be boiled and filtered before using, and should be used while warm, and injected very slowly, as quinine in concentrated form is a powerful depressant of the heart. As we have other rapid, efficient, and comparatively safe methods of introducing quinine into the system at our command, this one cannot be recommended.

Physiological Action.—The influence

of quinine upon the vital processes in general is a depressing one, if the ratio of waste-products is to be taken as a guide. The elimination of nitrogenous products is especially reduced. Upon the blood the effects vary according to the mode of administration, the influence upon the corpuscles being much greater when the salts are given hypodermically. The migration of leucocytes through the vascular walls is, to a degree, inhibited by large doses, during an inflammatory process. When given in anæmic conditions, the red corpuscles are increased in number, sometimes very markedly. On the other hand, the presence of quinine in the blood increases the action of heat upon these elements. Leucocytes, for instance, which continue active at 107° F. rapidly lost their activity when large doses of quinine are administered. Toxic doses for the organism are the same as those which are fatal to the leucocytes: 1 grain for every 3 $\frac{1}{3}$ ounces of blood (Maurel). After a malarial febrile crisis it causes marked reduction of temperature; in other fevers it also—though not always—acts as an antipyretic; but its propensity to produce cerebral congestion renders other antipyretics preferable.

As to digestion, the experiments of Bünin have shown that the hydrochlorate does not retard it, while the sulphate of quinine does. Both of these salts in large amounts increase the acidity of the gastric juice and the absorptive power of the stomach. Process of peptonization of proteids and the energy of the rennet ferment is not affected. One-half of this amount exerted a similar action upon the gastric function, though the effects were less constant and pronounced. The pernicious effects of quinine upon the stomach are avoided, when moderate doses are used, by administering it *during* a meal.

Quinine is a cerebral stimulant, but if

administered in large doses it induces congestion. The dizziness, tinnitus, "roaring," and intense headache complained of are due to this cause. Unconsciousness is sometimes observed.

Case of man who took about 40 grains of quinine for malaria. In an hour he became unconscious, pallid, with cold surface. The pulse and respirations were feeble and rapid. Camphor and ether injections aroused him in another hour, but he could not see. He then slept for eight or nine hours. On awakening his sight still troubled him, but he recovered from this rapidly and went to work the next day. He complained of no tinnitus or deafness at any time. Grosskopf (Ther. Monats., Oct., '92).

Large doses depress the spinal centres, while small ones merely reduce the reflex activity by stimulating the reflex inhibitory centres.

The essential features of the disorders of vision due to quinine are mainly the result of pronounced contraction of the retinal arteries and veins and a decided fullness of the capillaries of the optic disk as a permanent condition (Gruening). According to de Schweinitz, the lesion in quinine amaurosis is peripheral: Primarily, there is ischæmia of the retinal and optic nerve-vessels, caused by their intense contraction; if the blindness continue for a sufficient length of time, atrophy of the optic nerve and tract associated with vascular changes, indicating vasculitis and endovasculitis ensue, followed ultimately by obliteration of the lumen of the vessels.

Quinine in toxic doses may produce blindness. The toxic dose is distinctly indeterminate. The duration of the amaurosis varies largely. The field of vision remains contracted. Central vision usually returns to the normal. There is color-blindness at first; the color-perception is ultimately restored within the central field. The ophthalmoscopic picture is that of white

atrophy. Experiments on dogs show that there is atrophy of the entire optic tract. The same experiments show that the cells of the cuneus are probably not affected. Claiborne (N. Y. Med. Jour., June 30, '94).

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In dogs large doses of quinine cause marked contraction of the vessels of the optic nerves, and sometimes complete obliteration without traces of inflammation. The fibres of the nerves are always normal. The vascular contraction sometimes involves the vessels of the iris and choroid. Quinine was found in the ocular fluids, from which it is inferred that the direct action of the drug is on the vessels and on the rods and cones, where its effect is to paralyze. In quinine amblyopia ischaemia of the retina is always present in all cases, whether cured or not. De Bono (Arch. d'Ottal., vol. ii, fasc. 3-6; ref. Rec. d'Ophthal., Jan., '96).

Incomplete ocular cinchonism is not rare, and in an hour after 20 grains of quinine have been taken some accommodation paresis may be noticed in a good percentage of cases, as was noted in a case mentioned. J. C. Clemesha (Buffalo Med. Jour., Nov., '98).

Study of the pathological changes produced by injecting quinine hypodermically in dogs. Although the arteries were constricted, no histological changes were noticed in vessels of the nerve or retina, there being neither thickening of the vessel-walls nor proliferation of the endothelium. The pathological process consists in a constriction of the retinal vessels, and particularly of the arteries, followed by a highly-albuminous serous exudation into the nerve-fibre layer, and a degeneration of the ganglion-cells, together with their axis-cylinder processes, which become the centripetal fibres of the optic nerve. Holden (Archives of Ophthal., Nov., '98).

The effects upon the hearing mainly depend upon congestion. According to Kischner and Grunert (Archiv f. Ohrenh., Nov. 30, '98), if the internal ear is unduly congested by an overdose

of quinine, it may never recover its function.

Upon the respiration quinine in very large doses has a depressing action, but in medium doses its effects are *nil* or slightly stimulating.

Quinine is mainly eliminated through the kidneys when administered by the stomach. When given by the rectum, the gastric mucous membrane assists in the process of elimination (Kandidoff). A large proportion of the salt taken in any form is also destroyed in the tissues by oxidation. A small proportion begins to appear in the urine very soon after the drug is taken, but, on the whole, the process of elimination is a slow one.

The effects of quinine salts upon the malarial parasite are studied under MALARIAL FEVERS in volume iv.

Poisoning by Quinine.—Poisoning by quinine is practically unknown. The untoward, or disagreeable, effects of quinine are noted under the heading treating of its physiological action, and noted briefly under CINCHONA in volume ii.

Therapeutics.

Malaria.—The most important therapeutic application of quinine is in the various forms of malarial disease. Quinine is a specific in this class of disorders, and is used as a prophylactic as well as a curative agent.

In the treatment of intermittent fever Bartholow observes that quinine is equally effective whether administered in the interval or during the seizure; that, if time is an element of importance, no delay is necessary in order to give the quinine in the stage of apyrexia; that the attack should be anticipated, and, if possible, prevented; that, as the maximum effect of quinine is attained in about five hours after ingestion, it should be given at least that long before the paroxysm; and, finally, that, as the

elimination of quinine takes place with considerable rapidity, the maximum curative effect follows the administration of the whole amount required in a single dose. Although small doses, frequently repeated, will cure intermittent fever, better results are obtained from a full dose (10 to 15 grains) given in the sweating stage, and the same dose five hours before the expected paroxysm. In any case the patient must receive the full physiological dose of quinine. In the treatment of this, as of all malarial affections, the bowels should be kept open and the liver properly functioning by an occasional mercurial purge; in fact, it is good practice to initiate the treatment with a full dose of calomel or blue mass. (See MALARIAL FEVERS, volume iv.)

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In malarial fever use of quinine four or six hours before the attack reduces the number of parasites quite notably one hour or three hours later. The new generation is weak and represented by a few young spherules. These are roughly granular and without amœboid movements. When quinine is given twelve to ten hours before the attack the number of parasites diminishes, but not so notably. The remedy has least effect upon the crescents. Jancso and Rosenberger (*Pester med.-chir. Presse*, No. 8, '96).

For hypodermic injections of quinine following solution, first proposed by Kelsch, recommended:—

℞ Hydrochlorate of quinine, 45 grains.
Antipyrine, 30 grains.
Distilled water, 1½ drachms.

A test-tube having first been rendered perfectly clean, boiling water is placed in it, and the ingredients added; these immediately dissolve, and the solution boiling hot is filtered through a sterile piece of muslin or a sterile paper. As soon as the liquid cools sufficiently, an hypodermic syringe is filled, and, the skin having been carefully disinfected, an injection is given.

In cases of remittent malarial fever in which the stomach is in such a condition that quinine cannot be given, and the fever must be overcome, this treatment is useful, and also is of value in cases where malarial poisoning is so grave that active antimalarial influence must be brought to bear at once. Dose of the solution is 15 minims for adults and from 5 to 10 minims for children. Should the malarial fever take an algid form, 30 minims of ether are injected simultaneously. Blum (*Jour. des Prat.*, Mar. 21, '96).

In bilious, or remittent, fever, quinine, preceded by a cholagogic purge, may be given in doses of 2 to 4 grains hourly, or in one or two large doses one-half to one hour before the expected paroxysm. If the paroxysm be near at hand, the quinine is best given dissolved by means of aromatic sulphuric acid (drop for grain).

Literature of '96-'97-'98.

Proper treatment of bilious fever of Africa consists in administration of large doses of quinine. Small doses aggravate the trouble, but large doses are specific. Quinine is also a reliable prophylactic. Steudel (*Med. Rec.*, June 21, '96).

Severe cases of malaria seen in India treated by giving moderate doses of quinine immediately after the paroxysm. No case ever noted which would not respond to this method of administration of quinine. The drug should be continued for some days after the paroxysm. M. C. N. Row (*N. Y. Med. Jour.*, Jan. 15, '98).

When quinine is given as a prophylactic, the use of 2 to 4 grains or more, three times daily, is advised.

In malarial cachexia, or hæmorrhagic malarial fever, quinine generally does harm. The danger in using quinine is from irritating the engorged kidneys after the chill has passed by; to do good, therefore, it must be given long enough

before the paroxysm to prevent it. Quinine is not an hæmostatic, and is useful only through its power to prevent the paroxysm which causes the hæmaturia. In hæmaturia from chronic malarial poisoning without the occurrence of a chill or occurring instead of a chill, quinine is of no value. Some observers have noted hæmaturia after the use of quinine, and ascribe to the latter a causative action.

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It is believed that quinine hæmoglobinuria occurs only in those whose organs have been altered by malaria, quinine alone being insufficient to produce it. Murri (*Arch. Ital. de Biol.*, tome xxviii, fasc. 3, '97).

Hæmorrhages are apt to follow the administration of quinine in malaria when the action of the kidneys is partially or completely suppressed. J. H. Sears (*Charlotte Med. Jour.*, Nov., '97).

In normal animals quinine causes congestion of the kidneys, and, as malaria causes similar disturbances, it is possible that the drug may at times act injuriously. In hæmoglobinuria, occurring with the paroxysm, quinine is probably useful for the purpose of stopping future attacks. In severe forms of malaria, with jaundice and hæmorrhagic tendency, quinine is sometimes necessary to combat the disease, but it is desirable, even in this case, to see that other drugs are used first. H. A. Hare (*Med. Rec.*, Jan. 7, '99).

In pernicious malarial fever there is usually no time to wait, and 30 to 75 grains of quinine should be given by the mouth, by the rectum, and subcutaneously, in divided doses within twelve hours. In addition to the administration of quinine, symptomatic treatment is usually necessary on account of the condition of the gastro-intestinal tract, the kidneys, the lungs, and the nervous system, any or all of which may require attention.

In chronic malarial intoxication evinced by diarrhoea, dysentery, jaundice, or chorea, occurring in the periodical form, quinine does good alone, or better when combined with iron or arsenic. In brow-ague, or malarial neuralgia, quinine often relieves in doses of $1\frac{1}{2}$ to 3 grains given every hour or two.

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Quinine is a specific for the simple intermittent or remittent forms of malaria only, and has no specific action in the chronic forms of the disease which are associated with no fever or with a continuous fever. J. G. Van Marter, Jr. (*Va. Med. Semimonthly*, Jan. 28, '98).

ANTIPYRETIC ACTION.—The antipyretic action of quinine is obtained from doses of from 15 to 30 grains given in the course of an hour. For the reduction of the temperature in typhus and typhoid fever, quinine, even in very large doses, is inferior to the newer antipyretics, which latter have, in turn, been superseded by the use of cold baths. In these fevers quinine will seldom cause a considerable fall of temperature before crisis or lysis, but will aid in the fall actively after these changes; in other fevers any good results obtained through the use of quinine are due either to specific antimalarial influence or to its stimulating influence upon the general system. (Hare.)

Quinine has been used in yellow fever, and in the hectic fever of phthisis in doses of 2 or 3 grains given every two hours.

Urethral fever from catheterization may be prevented by quinine, given in full dose before the introduction of the catheter.

In acute and subacute rheumatism, lumbago, and muscular pain from cold, quinine salicylate may be given in doses of from 10 to 30 grains during the at-

tack, and in smaller tonic doses (1 to 2 grains) three or four times daily, after the painful symptoms have subsided; in this latter condition the following is useful: Sulphate of quinine, 1 drachm; tincture of the chloride of iron, 1 ounce; elixir of cascara sagrada, 4 ounces; of this take a dessertspoonful three or four times daily.

INFLAMMATION AND SUPPURATION.—In acute catarrhal inflammation of the air-passages 10 grains of quinine combined with Dover's powder, opium, or morphine, if given early, will avert the attack. Ten grains of quinine given at the beginning of an attack of acute tonsillitis will sometimes abort the disease and prevent the formation of pus.

In influenza 8 grains of quinine taken every day or two acts efficiently as a prophylactic.

In the broncho-pneumonia of measles large doses of quinine relieve the catarrhal pneumonia and retard or prevent cheesy degeneration of the lung.

In the lobar pneumonia of children 2 grains of quinine given three times daily will favorably influence the disease. In the pneumonia of adults quinine checks the escape of the white blood-corpuscles and prevents the exchange of oxygen by the red blood-corpuscles. In croupous pneumonia, pleurisy, and endocarditis 20 to 40 grains of quinine, administered during the congestive stage and before exudation has occurred, is said to abort the disease.

In septicæmia, pyæmia, and puerperal fever good results are obtained through the use of from 5 to 20 grains of quinine every four hours. When abscesses are present quinine reduces the discharge and prevents sapræmia or pyæmia. In erysipelas quinine may be given alone in doses of from 5 to 20 grains every four hours or in smaller doses (2 to 5 grains)

combined with the tincture of the chloride of iron (10 to 20 minims).

TONIC.—As a tonic, quinine is not only a simple bitter, but it also seems to have a direct effect in increasing the number of the red blood-corpuscles. The tonic dose of quinine is from $\frac{1}{2}$ to 2 grains. In all atonic disorders—such as neuralgia, dyspepsia, night-sweats of phthisis, general debility, neurasthenia, etc.—quinine is a reliable remedy. In simple debility or that following convalescence from an acute disease, quinine in 1- or 2-grain doses given three times daily will prove beneficial. Quinine is useful when prolonged mental or physical strain is to be undergone; 2 to 4 grains daily will often prevent exhaustion and support the system.

In hemicrania due to malarial intoxication, and associated with a nervous condition or hysteria, the valerianate of quinine in doses of from 1 to 6 grains, repeated every two to six hours, will afford relief.

Catarrh of the stomach, due to alcoholic excess or not, will be benefited by small doses of quinine hydrochlorate, temporarily employed; its value is enhanced by combining it with a mineral acid; its beneficial action ceases when irritation of the gastric mucous membrane is produced through its use.

In subacute gastro-enteritis (cholera infantum) quinine will often effect a cure after astringents and laxatives have failed. Quinine is also good in the following condition: Tenesmus, and after much straining the patient voids a transparent mucus streaked with blood, with no fever or other disturbance of the bowels, and stools, when passed, are natural (Bartholow).

In delirium tremens tonic doses of quinine do good. In bronchorrhœa quinine in tonic doses will lessen the discharge.

In cases of prolonged suppuration quinine in tonic doses is of value as a support to the system.

In the eruptive fevers, variola, scarlatina, measles, etc., quinine in small doses, frequently repeated, are valuable in adynamic states, and in larger doses at longer intervals to control hyperpyrexia.

CUTANEOUS DISORDERS.—In many skin diseases—acne, impetigo, erythema nodosum, and ecchyma—small daily doses of quinine are beneficial. Quinine is often an ingredient of hair-tonics on account of its antiseptic and tonic action. Brinton suggests the following in alopecia: Sulphate of quinine, 80 grains; alcohol, 4 ounces; tincture of capsicum, tincture of cantharides, and aromatic spirit of ammonia, of each, $\frac{1}{2}$ ounce; glycerin, 4 ounces; water, a sufficient quantity to make 1 pint; to be used locally, being well rubbed in.

ANTISEPTIC.—Quinine has decided antiseptic properties. It is often used for intestinal antiseptics. In amœbic dysentery quinine by rectal injection will effect a cure; a solution of the strength of 1 to 3000 will destroy the amœba coli.

In cholera the use of quinine was suggested by E. B. Fullerton (N. Y. Med. Jour., Aug. 18, '94), 15 to 20 grains being given within two hours at the beginning of the attack; he also advised its use as a prophylactic.

In typhus fever the salicylate of quinine is recommended as an intestinal antiseptic. In aphthous ulceration consequent to enterocolitis and in the yeasty vomiting produced by the growth of *Sarcina ventriculi* quinine is valuable. In subacute or chronic cystitis the irrigation of the bladder with a 2-per-cent. solution of quinine will prevent decomposition of the urine. In hay fever, after the subsidence of the acute symptoms, nasal irrigations, with an aqueous solution (0.2 per

cent.) of the bisulphate of quinine, have been followed by great relief. Quinine has been used externally as an antiseptic dressing to wounds, ulcers, etc.

In infected wounds which show no disposition to heal, treatment with a 1-per-cent. solution of sulphate of quinine cleanses them rapidly and tends toward recovery with greater rapidity than with a dressing of sublimate or iodoform. Wounds not infected also recover with astonishing rapidity under its influence. Alfödi (Ther. Monats., Feb., '93).

ANTISPASMODIC.—Quinine has been found useful in various disturbances of the motor system. The hydrobromate of quinine has given relief in many cases of laryngismus stridulus.

In asthma, after the severity of the paroxysm has somewhat abated, quinine has been useful in the succeeding fever and later as a restorative tonic.

In some cases of pertussis great benefit has been derived from the use of quinine, $1\frac{1}{2}$ grains being used for each year of the child's age, to be given at 6 A.M., 2 P.M., and at 10 P.M., as suggested by Barow. It may also be given in large doses conjoined with the local use of a quinine solution (0.2 per cent.) in spray as advised by Henke. Hare uses quinine chocolates (1 grain of tannate in each) internally and a spray by means of an atomizer (solution 1 or 2 grains to 1 ounce), the tip of the atomizer being carried well back of the root of the tongue, and used every few hours; if the taste of the quinine is very objectionable, a solution (1 per cent.) of cocaine may be painted over the dorsum of the tongue.

This quinine-spray is also useful in coryza and in fœtid sore throat.

In chorea H. C. Wood has suggested the use of large doses of quinine with the idea of stimulating the inhibitory control of muscular movements, resting upon the theory that this disease is due to lack

of inhibitory control of muscular movements.

ECBOLIC AND EMMENAGOGUE. — Quinine has been used in uterine inertia in weak and debilitated women. It is, however, little used, as it lacks efficiency. Quinine of itself will not cause abortion; but, in nervous or hysterical patients having a tendency to abort, it is best to combine with it a sedative, as one of the bromides or opium, when necessity demands a full dose of quinine.

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As an oxytocic, quinine sulphate usually acts within twenty to thirty minutes, and should be given in two doses of 8 grains each, repeated after an interval of ten minutes. It is indicated when uterine contractions are insufficient or inertia exists during the dilatation of the cervix, and when the health of the mother or child is threatened, especially when the membranes have ruptured and delivery must be hastened. Schwab (*Jour. de Méd. de Paris*, Nov. 29, '96).

For quinine the following advantages as oxytocic noted: (1) its preparations are not variable; (2) it can easily be administered in the form of a pill, which will keep for any length of time without deterioration; (3) it does not cause tetanic contraction of the uterus, but merely increases the strength of the labor-pains, while allowing complete relaxation between them.

Quinine, like other oxytocics, must not be given when there is any me-

chanical hinderance to delivery, such as disproportion in size between the fœtus and the pelvis. Four-grain pills of the sulphate may be used, 2 of these being given to begin with, and, if necessary, another an hour later. Sometimes a fourth is used. Owen Mackness (*Edinburgh Med. Jour.*, May, '98).

In amenorrhœa quinine is given in small doses to stimulate the menstrual flow. It will also increase the lochial discharge. In anæmic patients quinine may, with advantage, be given with iron, manganese, or arsenic.

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Topical application of quinine to surface of vaginal mucous membrane in cases of leucorrhœa favored. It may be used either in the form of a douche or pessary, but latter form considered the better. Hardwicke (*Lancet*, Jan. 7, '99).

Muriate of quinine employed in treatment of leucorrhœa, granular erosion of the cervix, vaginitis, and septic endometritis. The drug is a powerful antiseptic and is slightly astringent. As an intra-uterine douche it has proved to be un-irritating and free from toxic effects. Pessaries containing 2 or 3 grains of the muriate combined with extract of hamamelis largely used. For douching, a grain to the ounce of warm boric-acid solution is employed, the same strength being used in douching the bladder. R. S. Miller (*Lancet*, Jan. 21, '99).

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R

RABIES.

Synonyms.—Lyssa; hydrophobia.

Definition.—An acute infectious disease of animals occasionally communicated to man, characterized by excitement, hyperæsthesia, deglutitionary spasm, and paralytic weakness; when not specifically treated ending in death,

and undoubtedly caused by a specific bacterial poison.

Incubation and Symptoms.—The period of incubation varies widely in different cases. It is shorter in children than in adults and in wounds about the face, head, and hands, or uncovered parts, than in the case of injuries received in

other parts of the body through the clothing. The severity and character of the wound also influences the time of onset, the symptoms appearing sooner in cases of infection from punctured and lacerated wounds.

The usual incubationary period is four to eight weeks, but it may be, in occasional instances, six months or even a year or more. The wound through which infection takes place has usually healed entirely before any symptom of rabies is apparent, but in some cases, when the disease appears, the wound becomes irritated and again inflamed. Of persons bitten by *rabid* dogs, only a small proportion—10 to 20 per cent.—become infected.

The early symptoms in man are general nervousness, with irritability, wakefulness, and depression of spirits. There is often headache and vague uneasiness, sometimes slight fever and rapid pulse, and the wound may become painful and the surrounding tissue show perversion of sensation, with some anaesthesia. Some slight stiffness about the muscles of the throat is now noted, the voice changes or becomes husky, and swallowing becomes difficult. Soon great restlessness and excitement supervene, together with general hyperaesthesia and abnormal reaction to external impressions of all kinds, to the extent, so soon as the height of the attack is reached, of causing reflex spasms. These spasms are quite distressing and severe, and involve particularly the muscles of the larynx, pharynx, and mouth, and are accompanied by a sense of intense dyspnoea. Attempts at swallowing or taking water precipitate the violent and painful spasmodic attacks, which fact causes the patient to dread even the sight of water; whence the common name of the disease: "hydrophobia."

There is often at this stage some mental disturbance, greatest at time of the deglutitionary and respiratory spasms, subsiding in the interval. In other cases delusions and hallucinations, with maniacal excitement, may continue throughout the attack. In some cases there are more general convulsive seizures, resembling, somewhat, those of tetanus. The disease may run its course without rise of temperature, but most cases show some febrile reaction, 100° to 102° being usual. There is oftentimes a copious secretion of saliva, which, owing to the difficulty in swallowing, is allowed to run from the mouth.

The acute spasmodic stage lasts for a day or two, and is then succeeded by a paralytic stage, in which the patient lies quiet, nearly helpless, confused, and finally unconscious. The heart-action becomes progressively more feeble, the respiration shallow and increased in frequency, and death ensues.

In man the initial stage of excitement is rarely absent. But in animals its absence is the usual rule, the stage of paralysis quickly supervening upon the first symptoms of the disease.

Mention should here be made of the so-called pseudorabies, or lyssophobia: *i.e.*, the morbid fear of hydrophobia, leading, by the influence of autosuggestion, to a group of nervous and hysterical manifestations closely simulating the true disease. A neurotic person of inherited nervous instability and easily influenced by suggestion is bitten by a dog supposed to be mad; after a variable time and often in direct consequence of having been joked about the danger, or from brooding over the possibility of an attack of the disease, some nervous symptoms paralleling those of rabies appear. The subject becomes apprehensive, despondent, restless, then excited,

and exhibits some spasm or a choking sensation in the throat, this being often only a perversion of the frequently-seen *globus hystericus*. Occasionally convulsive attacks of an hysteroid character occur. The patient exaggerates the danger and protests that he is really going mad. Other varied hysterical phenomena may be present. The attack does not progress, however: there is no disturbance of general health nor of any of the bodily functions, no temperature-changes, no weakness, no prostration. The attack lasts for days or weeks and then subsides. Probably no case has ever proved fatal, the alleged fatal cases being instances of true rabies, as, on the other hand, many of the cases of reported recovery from rabies are most likely instances of the pseudal affection.

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During the year 1897 three deaths were reported to the coroner's office of Philadelphia as having been due to rabies. A thorough study of the cases by the approved methods of the day was made, and the deaths were all found not to have been due to rabies. In order to allay, so far as possible, the deep-seated popular dread of the disease, though not denying its existence, Coroner Ashbridge called attention to the fact that during his seventeen years' service in the coroner's office not one of the many cases of hydrophobia so reported in the papers and investigated by those connected with the office had proved to be such upon careful inquiry. H. W. Cattell (Phila. Med. Jour., Jan. 14, '99).

Diagnosis.—There should be no difficulty in distinguishing between rabies and other affections of the nervous system in which spasms and cramp occur. In tetanus there is the typical trismus and an absence of any dread of water. The character of the wound in tetanus is also different and the incubationary period much shorter.

The greatest difficulty lies in distinguishing a true rabies from the pseudorabies above described. Here a careful consideration of all symptoms and a complete and searching test of the nerve-reactions may be needed to prevent error. The evident influence of suggestion, the discovery of hysterical tendencies and stigmata, the absence of any real prostration and of any progress in morbid process shall exclude the pseudohydrophobic cases.

In the clinical symptoms of hydrophobia the more the intellectual centres are disturbed, the greater the difficulty of diagnosis. In most cases in man, however, the intellect is untouched until the last moments. In timid persons there may be fear of death as they perceive the gravity of their disease. The great symptom is not "hydrophobia," but a disarrangement of inhibitory control of automatic reflexes of the throat and chest and muscular system, hyperæsthesia of the senses and skin, and a tendency thereby to convulsions. Sometimes the intellect is badly affected. J. Hartley Anderson (Phila. Med. Jour., June 3, '99).

Among the measures recommended by State Veterinarian Pearson to prevent the spread and suppress an outbreak of rabies is the immediate destruction of any animal that has with certainty been bitten by a rabid dog; in case of doubt the bitten animal should be quarantined for ninety days. For purposes of diagnosis a dog suspected to be suffering from rabies should, if possible, be secured and confined and kept under observation; in case of death a post-mortem examination should be made by a skilled pathologist, and the brain especially should be studied. When during an outbreak of rabies it is not possible to locate and secure all infected animals, all of the dogs in the district should be muzzled or confined. Editorial (Phila. Med. Jour., Apr. 8, '99).

Etiology.—It attacks by preference the carnivora and in particular the dog and allied species, although human be-

ings, cattle, horses, and swine are occasionally infected. It is transmitted from one animal to another by inoculation, usually from a bite, and is comparatively rare in countries and localities in which the muzzling of dogs is made compulsory.

In the dog the first symptoms appear from a few days to weeks after infection. The animal shows a change in disposition, becoming unusually irritable and snappish, although when left alone seeming dull and somnolent. Food is often refused and the animal eats or chews sticks, dirt, leaves, straw, etc. The dog becomes weak, tremulous, and unsteady on its legs in the paralytic or more common form, but in the "furious" form of the disease there is wild excitement, the animal running aimlessly about, barking, growling, and snapping at or biting anything in its way. In either case the creature soon becomes helpless, comatose, and dies. The toxic principle of rabies is widely diffused throughout the bodily tissues, and the disease has been produced by the experimental inoculation of portions of the nervous organs, salivary and mammary glands, suprarrenal bodies, and pancreas. The virus is almost surely the product of a specific micro-organism, although bacteriologists have thus far been unsuccessful in attempts to isolate the pathogenic germ.

The essential cause of hydrophobia is a specific virus, which can only be reproduced within the living organism. As a small quantity of this virus introduced into the tissues can result in the most serious consequences, there exists no doubt that it possesses the properties pertaining to living organisms, more especially the capacity of reproduction after its entrance into the body. That the disease is not caused by preformed ptomaines communicated from the saliva of rabid animals is shown by the variable and, on the whole,

long stage of incubation which precedes all true infective processes. Another convincing proof of its microbic origin is the well-established fact that the disease can be artificially produced by implanting fragments of brain- or cord-tissue, taken from animals dead of rabies, into healthy animals. Senn ("Principles of Surg.," p. 406, '90).

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Rabies is just as much a specific disease as syphilis, erysipelas, anthrax, etc. It is, as they are, a blood-poisoning, due to a specific virus, which gains access into the system by way of the blood, and should be looked upon as such. The disease known as rabies exists the world over, and is more frequent than many suppose. Denny (Northwestern Lancet, Apr. 1, '96).

The fact that Bruschettini has found the cause of rabies is doubted. In sixty cases of rabies personally examined, only once was a bacterium resembling Bruschettini's rabies bacillus found. Bacteria do not have anything to do with the etiology of the disease. E. Marx (Centralb. f. Bakt., Parasit., u. Infekt., Nos. 22 and 23, '96; No. 5, p. 205, '97).

Rabies is believed to be due to protozoa. The parasites only multiply in the nervous tissues and cannot be cultivated. In the living organism the virulence of the parasites is not reduced by simultaneous inoculation of virulent micro-organisms. The latter, on the other hand, are retarded in their development. A. Grigoriew (Centralb. f. Bakt., Parasit., u. Infekt., Oct. 12, '97).

Hydrophobia may be due either to a poison absorbed or it may be caused by constant direct irritation carried from the seat of the bite to the central nervous system, giving rise to hyperæmia of nerve-centres, and thus an increased function or abnormal action upon their part, inducing thereby all the symptoms of hydrophobia.

In all nervous forms of disease the main factor inducing the symptoms is active hyperæmia within, and therefore excessive function of, central nerve-cells. B. O. Kinnear (Med. Rec., July 22, '99).

OCCURRENCE IN MAN.—Rabies is always communicated to man by inoculation from bites of animals suffering from the malady.

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A bite of a rabid dog will produce hydrophobia in man, but the hydrophobic man does not reproduce it in others. Rabies may be continued from dog to dog, but not hydrophobia from man to man. William T. Walker (*Va. Med. Monthly*, Feb., '96).

It is a disease now rarely seen in America and in Germany, but it is somewhat more frequent in Russia and France. It was common in Europe some decades ago, but of recent years has been markedly less frequent. In the United States most of the cases during the last half-century have been reported from the Atlantic States. There was one outbreak of rabies in Ohio in 1810. Several instances of the disease's having been communicated to man by the bites of skunks have been reported from western States. Dulles, from 1888 to 1894, collected accounts of seventy-eight cases of hydrophobia, this number doubtless representing nearly all which occurred in this country during that period.

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Wilkes, of London, has seen but three cases of hydrophobia in the course of thirty-five years' practice in Guy's Hospital. Riggs (*Northwestern Lancet*, Apr. 1, '96).

Pathology.—The affection is, as above indicated, a specific toxæmia of unknown bacterial origin. Some morbid anatomical changes in the nervous system are nearly always found, these being: dilatation of capillaries and small blood-vessels; marked congestion, with accumulation of lymphoid cells in the perivascular spaces; minute extravasa-

tions of blood, and some degenerative changes in the ganglion-cells. These alterations have been noted in the brain-cortex, medulla, and spinal cord; and by Gowers are alleged to be most pronounced in the medulla and the region of the nuclei of the pneumogastric, hypoglossal, and spinal accessory nerves, the leucocyte-like accumulation being here so prominent as to merit the term "miliary abscess." The pathological changes in the spinal cord are usually not well marked.

In rabies, the brain, the cord, and meninges are usually congested and ecchymosed; the cord also shows small softened patches, particularly in the neighborhood of the nerves by which the virus has gained access to the central nervous system. The characteristic histological appearances fall into two groups. The first comprises the more diffuse changes in the direction of general œdema and hyperæmia, which indicate the commencement of inflammatory changes around the blood-vessels. The lesions in the second group are more definite and localized. The blood-vessels are, as a rule, dilated, and more or less extensive hæmorrhages can be seen in the neighborhood of the central canal, in the floor of the fourth ventricle, and scattered through the membranes; where these are not macroscopical, the microscope often reveals extravasated red corpuscles beside the dilated capillaries. Later on little hyaline globular masses appear in the small vessels, in the walls of which broad zones of wandering cells are noted. The walls are often hyaline and much swelled; the endothelium also proliferates, so that many vessels are obliterated and surrounded by thick hyaline masses. The changes are most marked in the situations indicated by the symptoms; that is, in the motor nuclei of the cord and medulla, in the neighborhood of the olfactory nerves, etc. The nerve-cells, particularly in the vagus and hypoglossal nuclei, are the next to suffer. They swell, and small hyaline bodies, sur-

rounded by a pale zone or by large vacuoles, appear in the vicinity of the nucleus. The pericellular space is filled with leucocytes, which press on the nerve-cells; later on the latter become pale and their nuclei disappear. These changes are considered to be absolutely pathognomonic of rabies. A small piece of the cord of the suspected animal should be hardened in alcohol, stained next day with aniline red, and the characteristic hyaline spots sought for. In this way a speedy and certain diagnosis has been made in over a hundred cases. Similar changes are found in the affected nerves; the salivary glands are also hyperæmic, and the acini surrounded by sound cells, in which the characteristic tiny hyaline bodies are present just as in the nerve-cells. The lungs and abdominal viscera are hyperæmic. Babès (*Wiener med. Blätt.*, Oct. 17, '95).

The pathological anatomy of the spinal cords of rabbits and dogs that had died of rabies studied. Macroscopically hyperæmia of the meninges and congestion and points of hæmorrhage in the substance of the cord were found in irregularly-distributed areas. Microscopically these areas were seen to be extensively infiltrated with leucocytes along the perivascular spaces and around nerve-cells, while there was proliferation of the endothelium of the vessels. Atrophy and vacuolation of the nerve-cells, leaving open spaces in the gray matter, were also observed. The nerve-fibres showed varicosity and vacuolation of the axis-cylinder, with degeneration of the myelin-sheath and increase in the neuroglia. The process, as a whole, consisted in an acute inflammation of the cord, tending to the destruction of the nervous elements and resulting in an hyperplasia of the neuroglia to replace them. Germano and Capobianco (*Ann. de l'Inst. Pasteur*, Aug., '95).

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The microscopical examination of a fatal case of rabies led to the following conclusions: In the dorsal and lumbar regions of the spinal cord there was intense hyperæmia of the vessels in the white substance, and especially in the

gray matter, with an infiltration of the perivascular spaces by lymphoid elements. In sections prepared after the method of Bousch there were several small black agglomerations at the periphery of the white substance, as well as a pigmentary degeneration of the cells of the anterior cornua and of Clarke's columns. In preparations stained with basic aniline dyes numerous cells of the anterior cornua and of Clarke's columns seemed deformed and altered, presenting a chromatolysis diffuse or in spots, and marginal or perinuclear. The nucleus was displaced toward the periphery, deprived of its membrane, and it sometimes stained more intensely than the cell-body itself. In certain cells the processes were broken. All these changes were more marked in the cervical enlargement and in the bulb. In the depths of the floor of the fourth ventricle there were small hæmorrhages. S. Tchernischeff (*Archives de Neurol.*, Apr., '99).

The pathologico-anatomical changes of asphyxia are often present, predominating in some cases or even being the only lesions found. The mucous membrane of fauces, pharynx, and larynx is often congested. The salivary glands have been found to show the changes of a mild inflammation, and a mild parenchymatous nephritis is often present. In dogs the stomach may contain straws, sticks, and other foreign matter eaten by the animal.

Prognosis.—The hope of recovery from true well-marked rabies is very slight, death ensuing after a few days in almost every instance. During the past ten years excellent results in preventing the development of rabies in persons bitten by rabid animals have been obtained by the use of the preventive inoculations spoken of below.

Treatment.—Immediately upon being bitten by a supposedly rabid animal a ligature should be placed upon the limb above the wound, the wound should be

disinfected or, better still, thoroughly cauterized by heat or by nitrate of silver, or carbolic acid, or in some cases may preferably be excised. The wound should not be closed, but kept freely open and allowed to bleed as much as it will.

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In dog-bites immediate treatment with strong fuming nitric or hydrochloric acid is recommended. One or 2 drops will suffice, and the slough soon separates, leaving a clean wound, which heals readily. J. C. Vaughan (*Indian Med. Gaz.*, No. 8, p. 273, '96).

In treating a patient bitten by an animal, the history of the animal should be obtained as far as possible. If the locality where the patient was bitten has been the seat of other cases recently, and the wound was in an exposed part of the body, hand or head, it should be cauterized thoroughly within twenty-four hours, an anæsthetic and nitric acid being used. Fuming nitric acid is more efficient than the actual cautery or pure nitrate of silver. If the wounds were severe, Pasteur preventive treatment should be given. If the bite was superficial or through the clothes, and the cauterization was made thoroughly within the twenty-four hours no more need be done, certainly not if there had been no cases of rabies in the neighborhood. The Pasteur preventive treatment can never do harm and, if the patient desires it, should be advised.

The disposition of animals which have bitten people should be as follows: Never killed, but captured, and placed in a kennel under lock and key for a week. If at the end of that time they are well, there is naturally no danger for the person bitten. If the animal dies, an autopsy should be made, all the organs examined, and a portion of the brain and spinal cord emulsified and inoculated in guinea-pigs and rabbits. If a disease which could cause death should be found in other organs, it is of importance; the inoculation tests should be made to demonstrate beyond a doubt that rabies was not also present in the

same case. Follen Cabot (*Med. News*, Mar. 18, '99).

At the time of onset of the first symptoms of hydrophobia these local measures may properly again be resorted to should any evidences of irritation of the wound be present. The patient should be kept in a darkened room and free from any sources of irritation or annoyance. Restraint of any kind is not necessary, there being, contrary to common belief, little or no tendency on the part of the patient to injure others, and there is no danger of those in attendance contracting the disease. The patient should not be forced to make attempts at swallowing food or drink. Nutrient enemata should be employed, and large quantities of water be given by the rectum.

Local applications of cocaine to the fauces and pharynx are said to prevent spasm and enable the patient to swallow.

During the violent spasms chloroform may be used by inhalation, and the administration of bromides and chloral by the mouth and of morphine hypodermically are followed by some amelioration of the acute symptom. Curare, in $\frac{1}{10}$ - to $\frac{1}{4}$ -grain doses every half-hour until muscular relaxation occurs, is lauded by some. All such remedies are, however, merely palliative and exert no influence over the course of the disease.

Preventive Inoculation.—The work of Pasteur in developing the treatment of rabies by preventive inoculation constitutes by far the most important addition to our knowledge of the nature of the affection and the possibilities of its cure which has been made since the disease was first recognized. Pasteur found that the toxin in the spinal cords of rabbits which had been killed by rabies inoculation gradually lost its virulence if the cords were kept for some

days under antiseptic precautions: so that after about two weeks the cord was no longer poisonous, inoculations from it failing to produce the disease. This fact offered then a method of gradually establishing an immunity, by inoculating the infected animal with cords which had, to a certain degree, lost their virulence through preservation in this way.

The production of artificial immunity is the now widely and successfully employed Pasteur treatment for rabies, persons bitten by mad dogs being carried through a series of inoculations with the spinal cords of rabbits. The inoculation is begun with cord which has been kept for 14 days; the second day cord 13 days old is employed; the third day 12-day-old cord, and so on until cord 5-day-old is reached, when a new series of inoculations is commenced with the cord of the ninth or tenth day. In the "intensive" method the inoculation of the morning of the first day is from cords 14 and 13 days old rubbed up together, cords of the 12th and 11th days being used the same evening, cords of the 10th and 9th days the following morning, and cords of the 8th and 7th the same afternoon. On the third day cord 6 days old is used; on the fourth day cord 5 days old, on the fifth day cord 4 days old, on the sixth day cord 3 days old; then a new series is begun with cord 5 days old. After from one to several weeks of this treatment the patient is regarded as immune, and the subsequent development of rabies is but slightly to be dreaded.

Instead of using Pasteur's method of protective "vaccination" for the animals from which the serum is to be obtained, according to personal method, the virus that is to be used is attenuated by a process of peptic digestion. The activity of the virus is thus so far modified that considerable doses may be injected at a

comparatively early stage of the process; the animals that have been so injected withstand the action of the more virulent virus within a comparatively short period. When an inoculation with a lethal dose of the poison is made, a comparatively small quantity of the serum serves to neutralize its effect if injected at once, and even if delayed until the end of the first half of the incubation-period the amount required to be given has only to be multiplied some six or eight times. It is possible, by drying, to prepare a "permanent" form of this serum which will, if kept from air and light, remain active for a long period. It is very portable, is readily dissolved, and may be used by anyone who is capable of sterilizing a subcutaneous injecting needle and syringe. The treatment, therefore, can be commenced almost as soon as the patient has received the bite, as it is not necessary that he should leave his home or his own medical attendant, with the result that the patient at once receives a quantity of the antitoxic material, which under the Pasteur method could only be manufactured in the body of the patient himself, and then in quantities sufficient to neutralize the infective material, say, after the second half of the incubation-period. Tizzoni and Centanni (*Atti della Reale Accad. delle Sci. dell' Inst. di Bologna*, Feb. 10, '95).

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The treatment of rabies, save Pasteur's, is unsatisfactory, and that is futile unless taken in time. Denny (*Northwestern Lancet*, Apr. 1, '96).

In the treatment of hydrophobia it is far better to expel the poison and withdraw the excess of blood from the congested cerebral area, than to attempt to immunize the party bitten by the further absorption of the same poison which induces the disease. The treatment personally advocated is the "Buisson" bath, which is a vapor-bath (commonly called Russian). The theory, according to Buisson, is simply that sweating (increased by hot drink) opens all the pores of the skin, and all poisonous matter in the blood or in surface wounds is forced

out through the pores. When the Buisson bath is used and profound sweating results, not only is the poison, if there is one, eliminated, but also the excess of blood, demonstrated to be in the central nervous system by the evidence of symptoms and also pathological testimony, is speedily withdrawn from the congested cerebrum and centres, and as a result the symptoms are subdued and the patient recovers. Beverly O. Kinneer (*Med. Rec.*, July 22, '99).

Of 14,000 persons inoculated in eight years only 70 died of the disease, these fatal cases being chiefly persons who came for treatment months after the bite was received. There can be no doubt that the mortality from rabies has been enormously lessened by the use of this method of treatment.

For the year 1889, in the Department of the Seine, 6 deaths occurred from hydrophobia: 3 in persons who had undergone treatment in the Pasteur Institute and the other 3 in those who had received no treatment whatever. Pasteur's inoculations do not prevent the disease. The rigid enforcement of the law in reference to stray dogs is of more importance. Dujardin-Beaumetz (*Jour. de Méd. de Paris*, '90).

The statistics of the Imperial Institute of Experimental Medicine at St. Petersburg for 1893: 486 persons applied for treatment,—the largest number thus far.

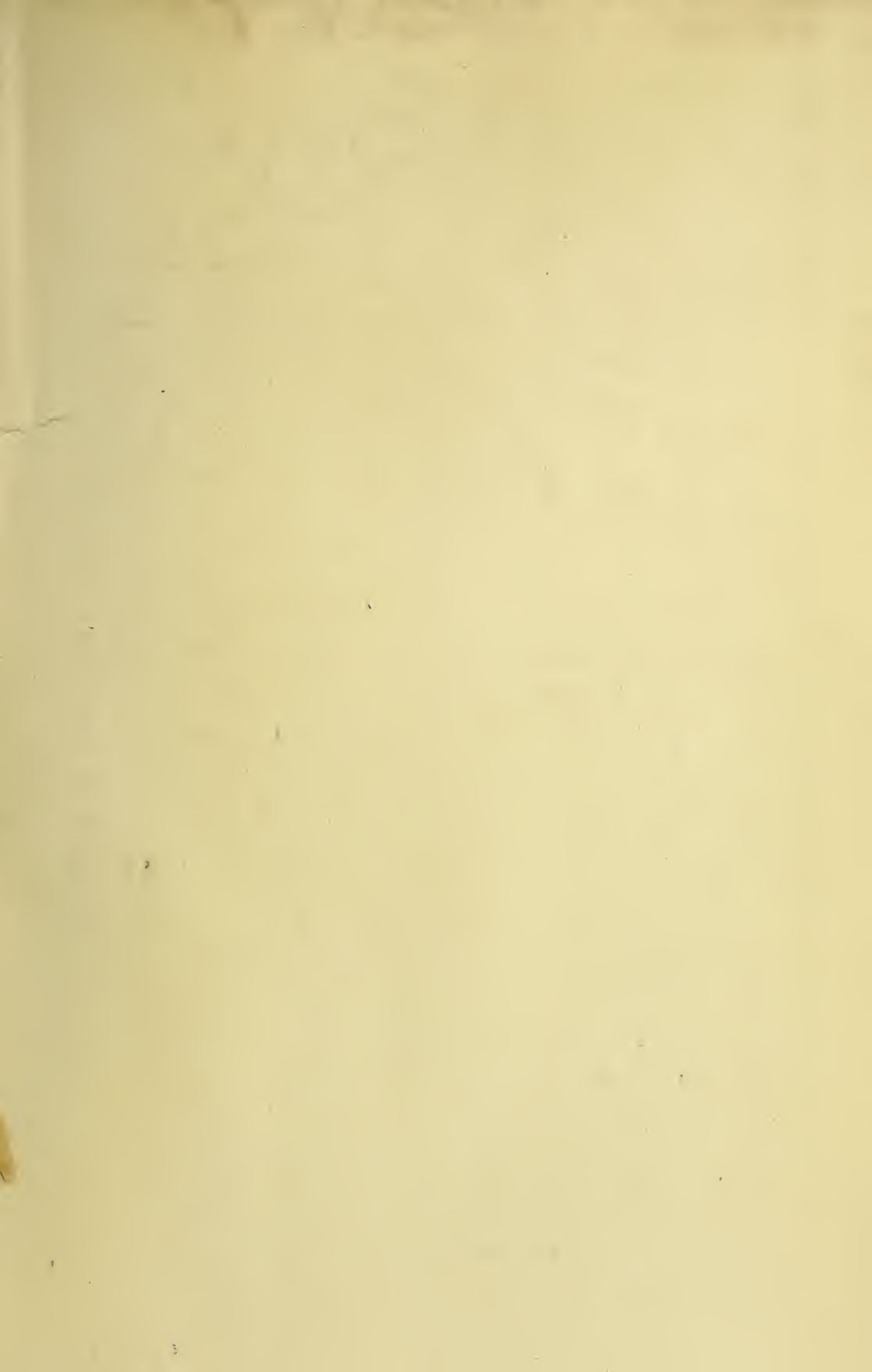
Of these, 101 were judged, for various reasons, not to require treatment. In addition to these 16 had no wound, 6 were bitten by animals which were found later on to be free from rabies, and 5 refused to continue the treatment. This makes the total number of patients 358, of which number 4 died, 1 during the treatment. Excluding this case, the mortality was 0.84 per cent. Kraïouschkine (*Archives des Sci. Biol.*, vol. iii, No. 2, '95).

From the annual report of the Odessa Antirabic Institute, it appears that, during 1894, 984 persons were treated, 42 of whom had not been bitten, but had been in danger of infection, either while treating men or animals suffering from the disease or in making autopsies of animals succumbing to it. The mortality was 0.21 per cent. Diatropow (*Archives des Sci. Biol.*, vol. iv, No. 1, '95).

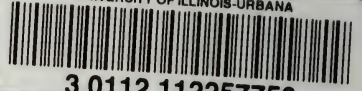
The following are statistics of the Pasteur Institute of Paris for 1894: 1392 cases treated, 12 deaths. In 5 of the mortal cases the first symptoms of rabies were evident less than fifteen days after the last inoculation. Not counting these, there remain 1387 cases with 7 deaths, or 0.50 per cent.; 3 cases, in addition, were attacked by rabies in the course of the inoculations. Out of the 1387 cases 226 were foreigners. Pottevin (*Annales de l'Inst. Pasteur*, July, '95).

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